JULY 6, 1944

American Machinist

TECHN LOGY DEPT

End-Quench Test Reveals Changes in Steel Induced by Heat

•

Controlled Lubrication Curtails Machine Tool Failures

•

Set-Ups to Increase Output With Formed and Multiple Wheels

•

How One Shop Forecasts Manpower Needs

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JUL 6 194
DETROIT

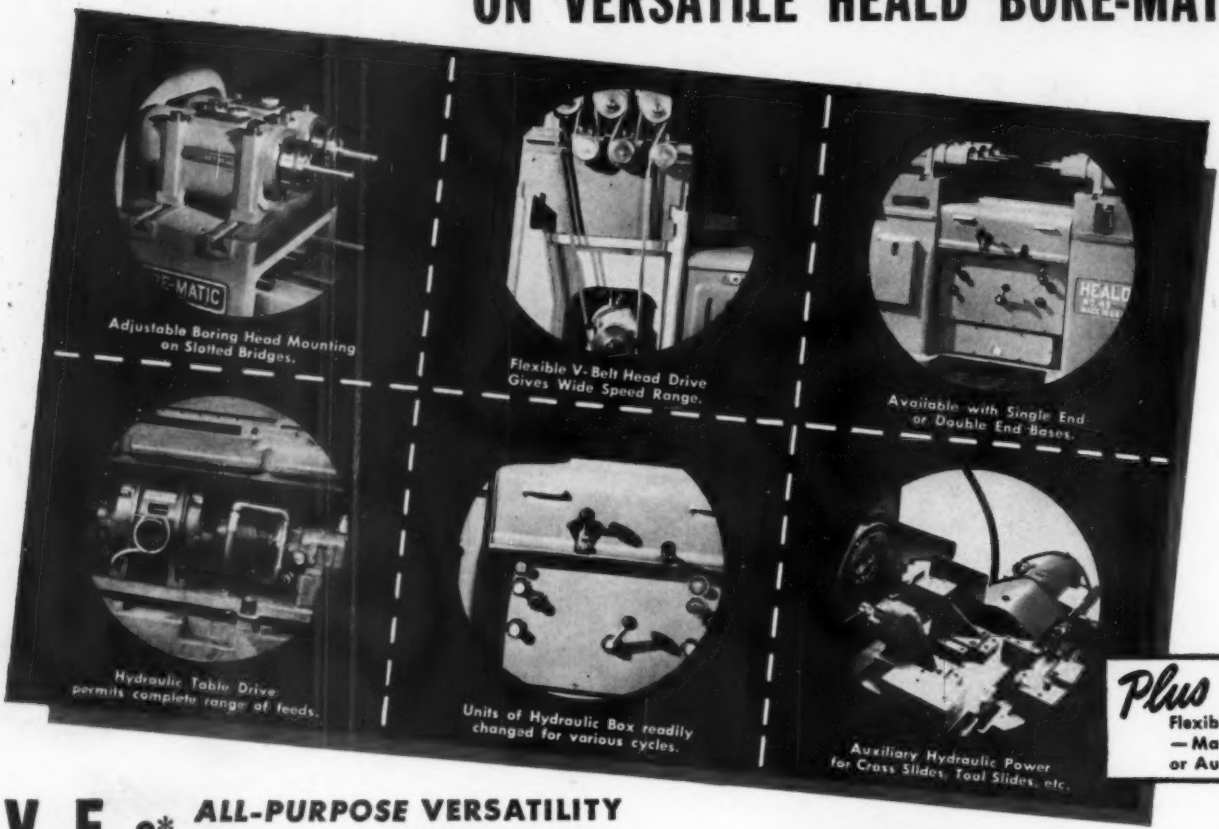
Future of Metal Stamping

FOURTH IN SERIES ON METAL-WORKING TOMORROW

R v.88+ Jy-Ag 1944

Meet Specific requirements of every job

ON VERSATILE HEALD BORE-MATICS

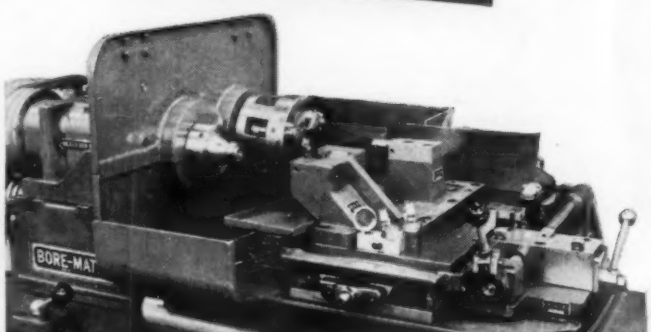

Adjustable Boring Head Mounting on Slotted Bridges.
Flexible V-Belt Head Drive Gives Wide Speed Range.
Available with Single End or Double End Bases.
Hydraulic Table Drive permits complete range of feeds.
Units of Hydraulic Box readily changed for various cycles.
Auxiliary Hydraulic Power for Cross Slides, Tool Slides, etc.
Plus Flexible Cycles — Manual or Automatic

V. F. 2* *ALL-PURPOSE VERSATILITY FROM BASIC BORE-MATIC DESIGN*

BORIZE ON BORE-MATICS . . . that means improved results on all operations . . . means better accuracy, finish, production for boring, turning, facing, chamfering, grooving, fly cutting, for straight and taper surfaces, for curves and irregular shapes.

All these operations would not be possible on a machine with fixed, rigid design. On Heald Bore-Matics, basic design is unusually flexible . . . has unusual versatility that permits individual arrangement to suit specific requirements of every job.

Versatility like . . . slotted bridges holding one or more boring heads for single or multiple operation . . . flexible, adaptable drive to heads by V-belts . . . single end or double end bases for single end or double end operations . . . hydraulic feeds, infinitely variable . . . auxiliary hydraulic power to operate cross-slides, tool slides, tool back-off clamping . . . machine cycles, manual or automatic to suit your requirements. Get the facts on Heald Bore-Matics now. Write The Heald Machine Co., Worcester 6, Mass.



LOOK FOR "V. F." "VERSATILITY FACTOR" in your Post War Tools

V. F. 1 — Application
V. F. 2 — Function
V. F. 3 — Tooling
V. F. 4 — Fixtures

This is *functional* versatility. Heald engineers took a standard basic single end Bore-Matic, mounted two heads on the bridge with special rotating fixtures, designed special tools, put them on a hydraulic cross-slide. Final result . . . completely automatic turning, boring, facing, necking, forming of bearing liners in two-stage progressive operations.

HEALD *Bore-Matics*

THE MOST VERSATILE MACHINE TOOL

Tech

TECHNOLOGY DEPT.

American Machinist

July 6, 1944

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_____

To _____

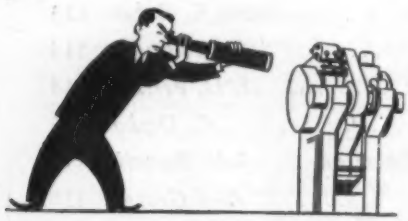
_____

Signed _____

American Machinist Chips

Stamping Marches On . . . This issue brings you the fourth in the series of feature articles describing and predicting "Metal-Working Tomorrow".

The war has shown that it is not necessary to have extremely large production runs to make stamping and pressing economical. Improved methods of die forming and the use of plastics and soft metals in dies has reduced pressing and stamping costs considerably. Stamping engineers feel that within reasonable limits nearly any part can be made of stampings if the engineer is consulted in the design stage of the part.



What has been learned about stamping methods, tolerances and economies is certain to have considerable effect upon post-war production . . . and this newest review of the situation as prepared by *American Machinist* editors, through extensive investigation and study, is certain to bring you many new ideas on this widely-used process.

Reprints of this article are available at a dime per. Preceding sections covering heat-treating, finishing and lighting are also still in stock for the same stipend.

Big Poosh . . . One of the McGraw-Hill editors, recently returned from an extensive reporting of construction activities throughout the Pacific battle areas, says that one reason our Seabees and Army engineers perform such astounding feats is that they have the use of modern, full-sized construction equipment. The Japs are not nearly so well equipped and have depended greatly on vast amounts of native hand labor.

A Bureau of Census report on the manufacture and sale of farm equipment and related products during 1943 gives some indication of how much American industry is contributing to the above effort. The total value of production in this field last year amounted to $613,456,094, a decrease of 5% from 1942. Most of the decrease was in agricultural machinery and implements (if you don't believe it ask the farmers!). The total decrease would have been considerably greater had there not been an *increase* of 30% in the production of tracklaying-type tractors . . . produced principally for military and industrial purposes.

Here's to more and better bulldozers.

Busy Mother . . . Delco-Remy is justifiably proud of employee Mrs. Elizabeth Doolittle. Like the famous general of the same name, she has done a lot. In her nearly 29 years of service . . . in the same department on the same job . . . she has filled grease cups for some 25,000,000 Delco-Remy distributors. A grand job by a Grand Lady.

Count on China . . . To place the Chinese Industrial Cooperatives on a sound footing, a Trust has been established in China to obtain machines and make them available to the cooperatives on a lease-purchase basis. Efforts will be made to buy, and have built in China, special machinery adaptable to C.I.C. use. When trade routes have been re-established, the Trust will endeavor to obtain equipment from the United States and England.

Silly Billy . . . A morsel from *High Gear*, monthly publication of Western Gear Works:

Maizie was a classy filly
Her working clothes were loose and frilly.
Work at Maizie's lathe now ceases
While frilly Maizie Rests In Pieces.

——and Double-Check . . . You probably saw the Armament Section in our June 8 issue, in which R. A. Trumpis of Lockheed Aircraft reviewed production practices in aircraft plants from 1941 to 1944.

We submit this as not only of vital importance to plane manufacturers, but also of considerable value to other types of plants. Some of the best minds in Metal-Working have been on the job of making plane production the last word in fast, efficient manufacture, and we believe this list of improved and improving practices is well worth the study of any production executive.

Improving Machine Tools . . . Our June 22 issue carried a stimulating article by H. T. Johnson of General Motors, in which 10 questions were posed on the efficiency of machine tool design. Also given was one set of answers, which reflected the composite opinions of master mechanics and plant engineers in various GM Divisions. For your convenience here are the questions:

1. *Is there a need for more standardization on the part of machine tool builders?*
2. *How far should machine tool builders go in the way of increased feeds and speeds and heavier, more powerful machines?*
3. *Will the preference in the future be for hydraulic or mechanical feeds?*
4. *Will the preference be for full electric controls?*
5. *Is the present emergency finish on machine tools satisfactory?*
6. *Will it be necessary for postwar machine tools to produce better finishes and more accurate work?*
7. *Are present chip disposal arrangements on machine tools satisfactory?*
8. *Are the present lubricating facilities provided on machine tools adequate?*
9. *Will hardened and ground ways be preferred?*
10. *Will the preference be for elec tronic controls?*

We'd like to repeat the editors' offer for all readers to give us their ideas of how machine tools can be improved. Answer the above or add ideas of your own. Comments will be reproduced in future issues and we'd like to have yours included.

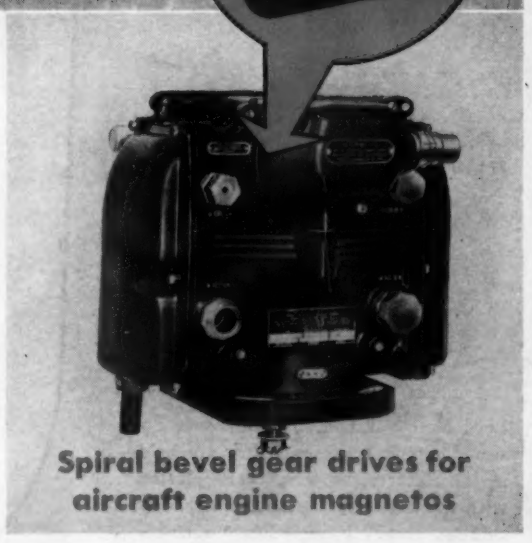
BEVEL GEAR DRIVES — TO *Victory*

International News Photo

40,000 SPARKS PER MINUTE!

Magnetos provide the spark of life upon which aviation engines depend. Spiral bevel gears drive the breaker cams which control the distribution of this spark with split-second timing to each one of the cylinders.

In order to supply this spark at the rate of 40,000 per minute, every minute in the air, these gears must operate with unfailing precision and smoothness at the high speeds required.



Spiral bevel gear drives for aircraft engine magnetos

Spiral bevel gears produced on Gleason machines are meeting the test daily . . . helping to keep cylinders firing and engines roaring uninterruptedly, both in routine flights and in the stress of dog-fights and bombing runs.

This ability of spiral bevel gears to operate smoothly and dependably at extremely high speeds will be available after the war to bring improved performance to the high-speed drives of the future.

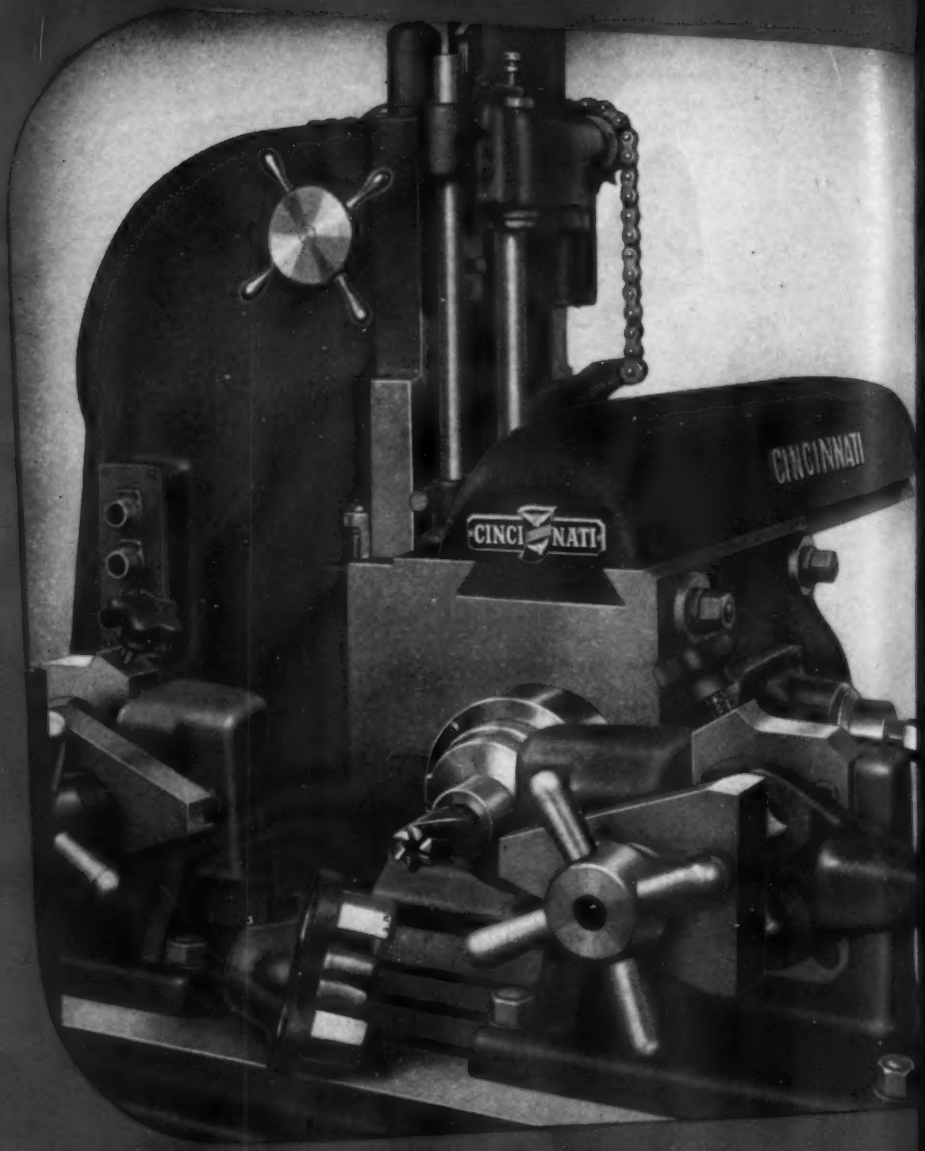
GLEASON

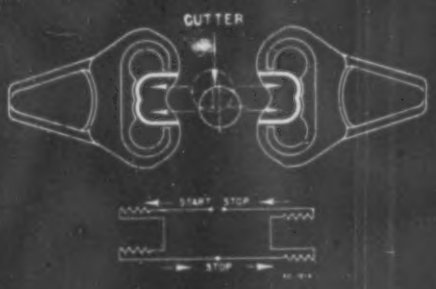
GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

Automatically milling *underneath*





Top: Sketch of two parts (and connection for tank tracks) as they are held in the fixtures, showing their relation with the cutter for automatic two-way milling. Heavy lines indicate surfaces milled. The operation is to rough mill the inside, using a reciprocating cycle and two fixtures, for maximum production. Directly above, diagram of automatic operating cycle, No. 29-AB.

Keep on buying WAR BONDS

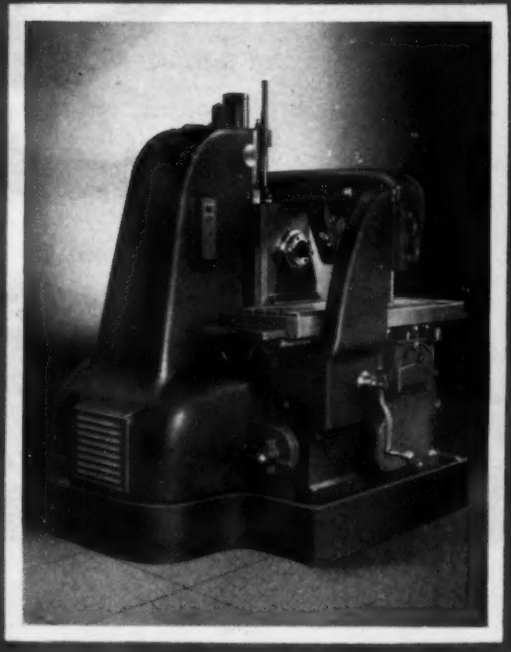
THE CINCINNATI M

MILLING MACHINES

ard on *top of* surfaces . . .

WITH A CINCINNATI 2—24

Many new developments and methods, perfected under the exigencies of war, eventually will be available for the production of peacetime needs. Here is one example: This CINCINNATI 2-24 Automatic Rise and Fall Miller, with an ingenious automatic cycle, mills the inside of end connections for tank tracks. Table movement is synchronized with the automatic raising and lowering of the spindle. Two fixtures are used and a special automatic operating cycle makes it possible to mill the upper and lower surfaces of a recess, like milling the floor and ceiling of a box. When milling operation has been completed on the part in the first fixture, the table automatically rapid traverses to the part in the second. Meanwhile the first fixture is reloaded. This arrangement assures almost continuous milling. ¶ Talk over your milling problems with the engineers here at Milling Headquarters. The latest milling improvements may have an important bearing on your own manufacturing processes, and now is the time to be planning for the day when the production of civilian goods is renewed.



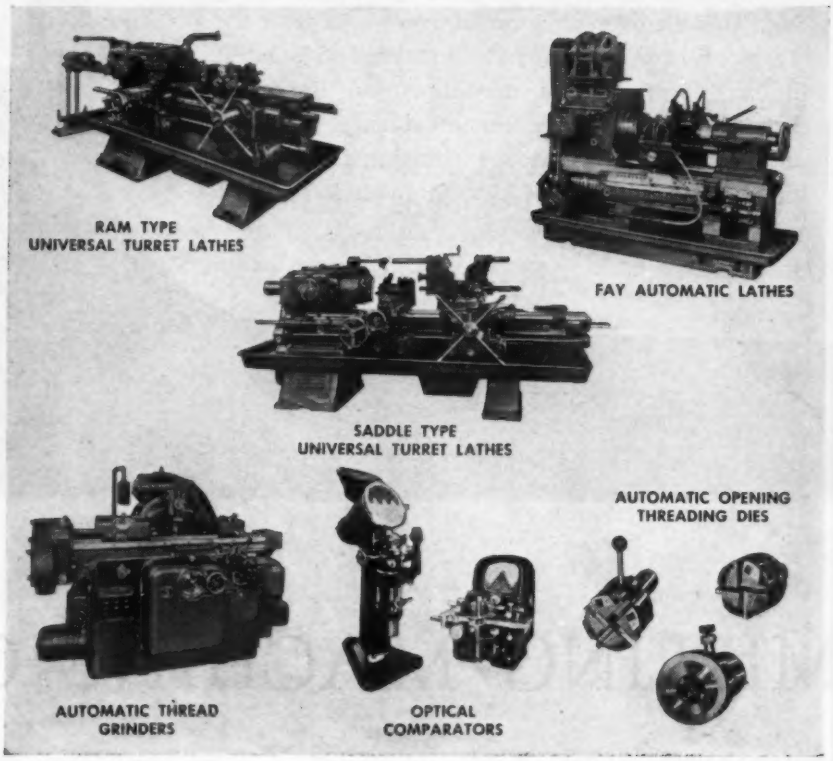
Illustrated above is the CINCINNATI No. 2-24 Automatic Rise and Fall Milling Machine. Complete details and specifications are given in catalog M-909-1. A copy of this book will be sent on request. For a brief description of all CINCINNATI Milling Machines, look in Sweet's Catalog File for Mechanical Industries.

CINCINNATI

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

How many hands does a turret lathe operator need?



JONES & LAMSON

MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

Many a turret lathe operator must have wished, at times, that he were like the six-armed deity of the Hindus, for faster-cutting tools have greatly increased the productivity of these machines and the burden upon the operator. The necessity for simplified controls to save waste motion and operator fatigue is, therefore, imperative!

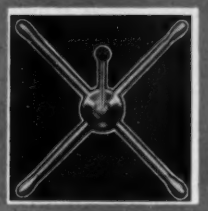
Jones & Lamson Universal Turret Lathes are designed not only to take full advantage of the fastest-cutting tools, but also to give every mechanical aid to the operator so that he can operate to the maximum capacity of the machine without undue fatigue.

We show here some of the man-saving, time-saving features built into these machines. Write to us for more detailed information and descriptive literature.

— only two — if it's a Jones & Lamson

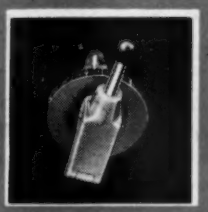
SINGLE LEVER SPINDLE SPEED SELECTOR

With direct reading dial, to control all spindle speeds. Next speed pre-selected while cut is in progress.



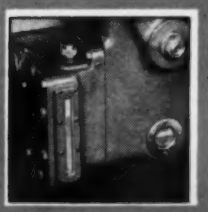
POWER TRAVERSE AND INDEXING OF THE HEXAGON TURRET

Turret of saddle type machines is power traversed and power indexed. A time saver and man saver too.



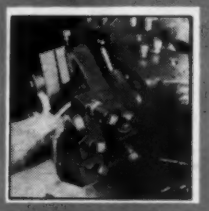
SINGLE LEVER FEED SELECTORS

Controlled by single lever, direct reading, selectors. Feeds pre-selected while cut is in progress.



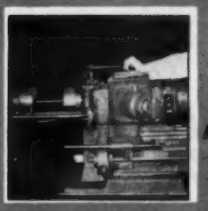
AUTOMATIC LUBRICATION SYSTEM

Requires minimum of attention. Flow of lubricant automatically increases as spindle speed increases.



AUTOMATIC COOLANT SUPPLY TO HEXAGON TURRET

A copious supply of coolant is pumped automatically to the working face of the hexagon turret.



SIMPLIFIED BAR FEED AND COLLET OPERATING MECHANISM

Operated by a single lever, which opens chuck, feeds in stock and closes chuck.

All these features and many others are incorporated as standard in Jones & Lamson Universal Turret Lathes.

Announcing

FOR SHAVING Internal

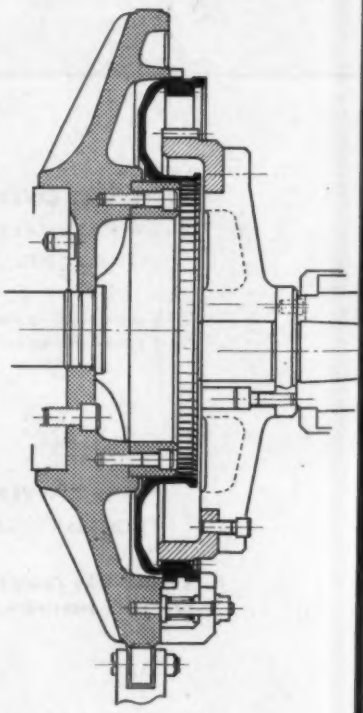
In presenting this new No. 11 Fellows Internal Gear Shaving Machine, attention is called to Fellows development of successful *parallel axes* shaving. By the proper selection of the rotating and reciprocating speeds, the tool is made to cut at the best rate in order to produce the maximum accuracy accompanied by a fine finish.

- ✓ Maximum Versatility through PARALLEL-Axes shaving
- ✓ Efficient Cutting, combined with Accuracy and Smooth Finish
- ✓ Maximum Rigidity and consequent Long Tool Life
- ✓ Inherent General Reliability

Efficiency and economy hitherto unavailable in finishing internal gears is now at your command. The new Internal Gear Shaving Machine handles both internal spur and helical gears.

A new descriptive bulletin is just off the press. Write: The Fellows Gear Shaper Company, Springfield, Vermont, or 640 West Town Office Building, Chicago 12, Illinois, or 616 Fisher Building, Detroit 2, Michigan.

★

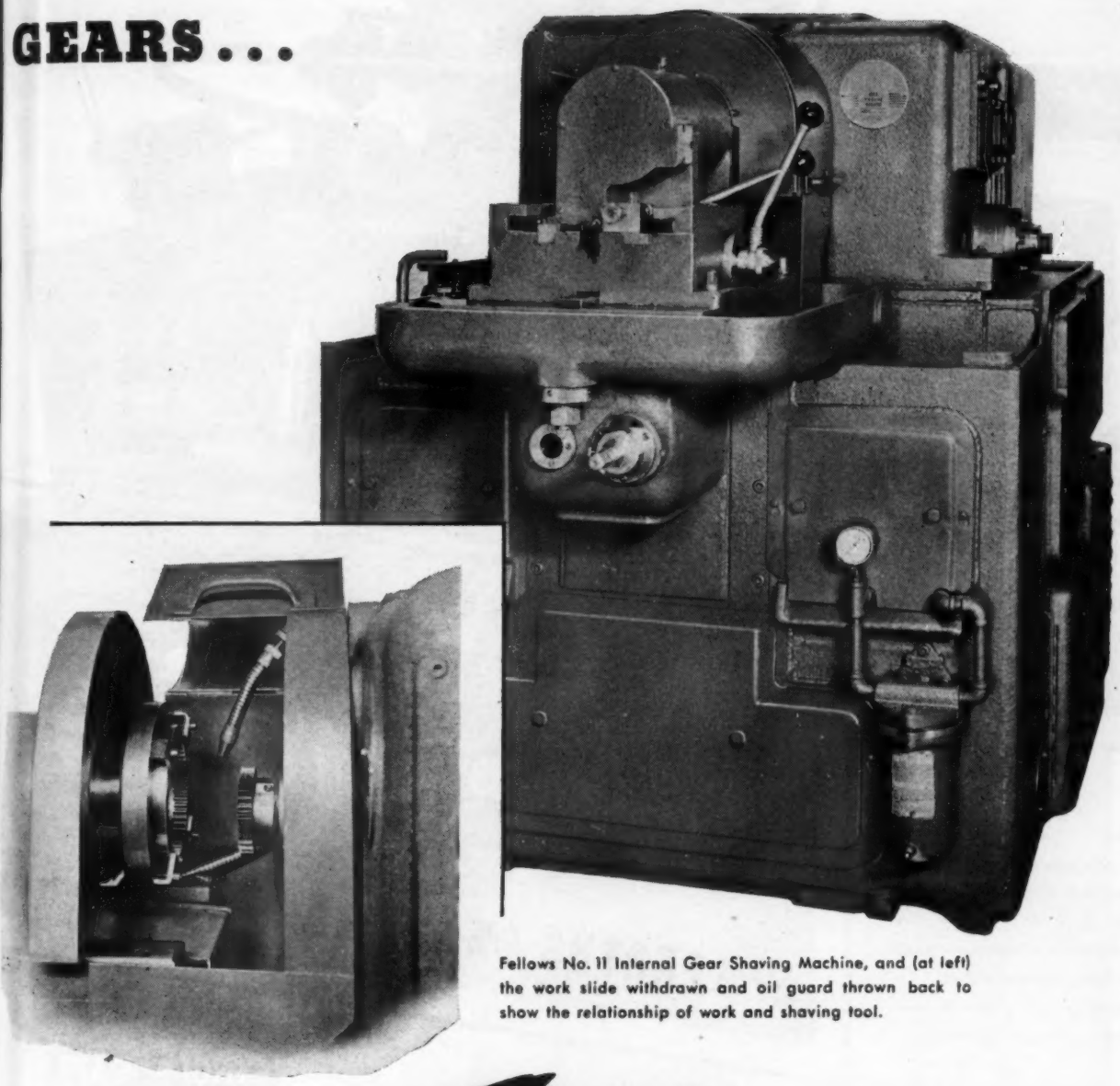


Illustrating how a Shaving Tool and Work-holding Fixture can be made to handle an exceedingly light-section internal gear having a projecting hub.

THE FELLOWS METHOD . . . MACHINES AND TOOLS FO

A NEW FELLOWS MACHINE

GEARS...



Fellows No. 11 Internal Gear Shaving Machine, and (at left) the work slide withdrawn and oil guard thrown back to show the relationship of work and shaving tool.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

INFEED profile

5" LENGTHS ON CINCINNATI 6" PLAIN

Above: Close-up of the extra equipment added to a standard CINCINNATI *6" Plain Hydraulic Grinder, to handle a wide infeed grinding operation on two shafts. The smaller of two shafts is between centers of the machine.*

CINCINNATI

Keep on buying WAR BONDS

CINCINNATI G

CINC

CENTER TYPE GRINDING MACHINES

CENT

To handle an infeed profile grinding operation requiring exceptionally wide wheels, the following extra equipment was added to a standard CINCINNATI 6" Plain Hydraulic Grinder: 1) Profile hydraulic wheel truing attachment, with round profile cams. 2) 4" and 5" wide wheels, suitable wheel mounts, and guards. 3) Hydraulic footstock. 4) Automatic infeed attachment. ¶ On this job the grinding operation called for four different size diameters on the large shaft, and three on the small one. Truing the wheels to meet specified accuracy of .0005" for each diameter was accomplished by the special profile hydraulic grinding wheel truing attachment over the wheel head. The machine, a CINCINNATI 6" Plain Hydraulic, is a comparatively small grinder, but its Filmatic Bearings and rigid construction make it possible to take this unusually wide cut. ¶ Here again, CINCINNATI Application Engineers have demonstrated that standard machines, slightly modified, or with extra equipment, are suitable for precision grinding special jobs. Perhaps some grinding operation in your manufacturing processes could be handled more efficiently. It may prove highly profitable for you to talk it over with the engineers here at Grinding Headquarters.

grinding

HYDRAULIC

Above: Sketch of the larger of two shafts. Notice the four different diameters; all of them, including the bevels, are ground at the same time by the infeed method. There are three diameters on the smaller shaft.

Right: CINCINNATI 6" Plain Hydraulic Grinding Machine. Catalog G-492-2 gives complete specifications. For a brief description of all CINCINNATI Grinding Machines, look in Sweet's Catalog File for Mechanical Industries.

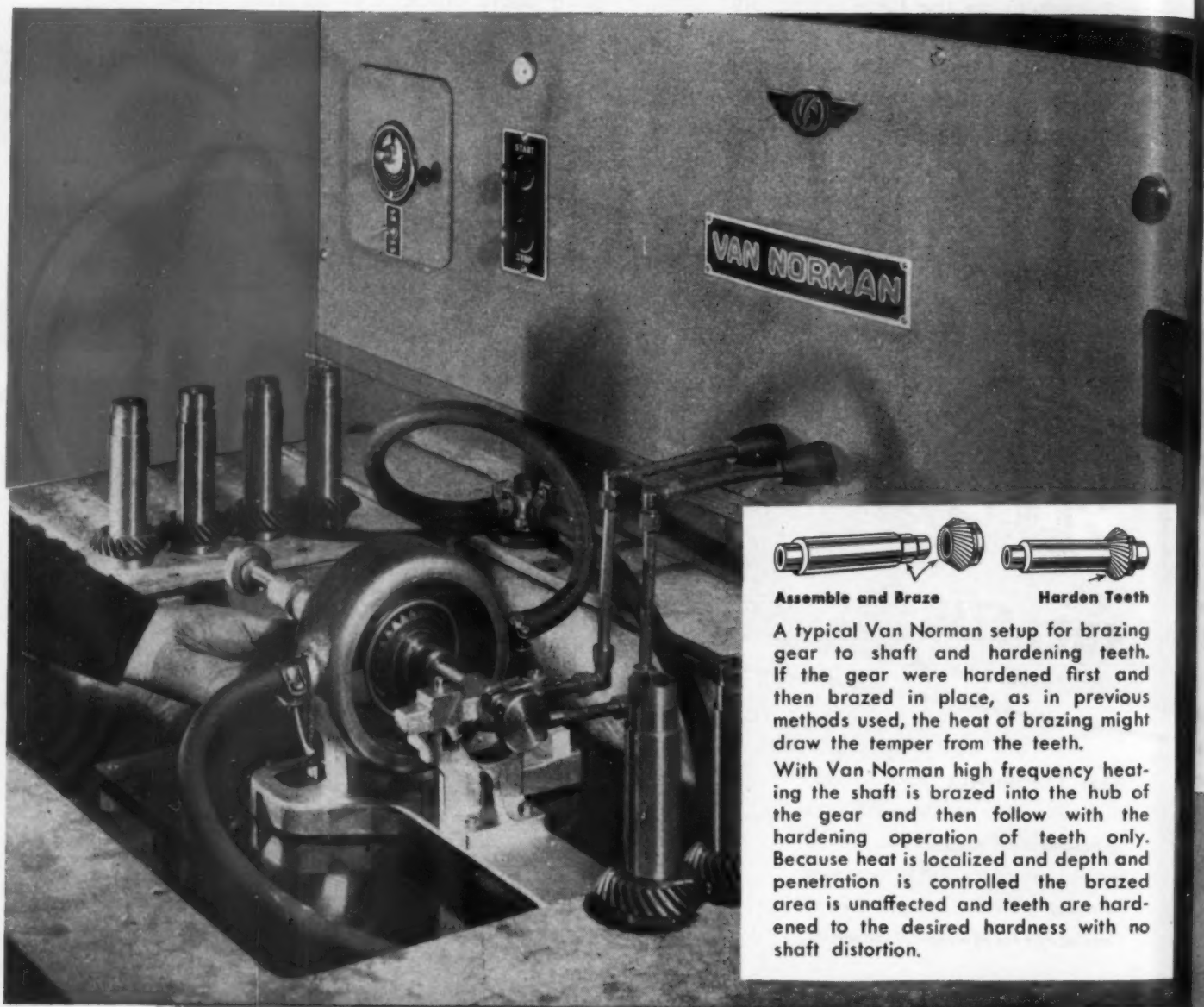
GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

You too, can use...

VAN NORMAN



Assemble and Braze **Harden Teeth**

A typical Van Norman setup for brazing gear to shaft and hardening teeth. If the gear were hardened first and then brazed in place, as in previous methods used, the heat of brazing might draw the temper from the teeth.

With Van Norman high frequency heating the shaft is brazed into the hub of the gear and then follow with the hardening operation of teeth only. Because heat is localized and depth and penetration is controlled the brazed area is unaffected and teeth are hardened to the desired hardness with no shaft distortion.

"It pays to Van Normanize"

HIGH FREQUENCY INDUCTION HEATING

Practically every plant, large or small can profitably use the Van Norman Induct-O induction heating converter for production or small lot hardening, brazing, soldering, annealing and other selective heating applications.

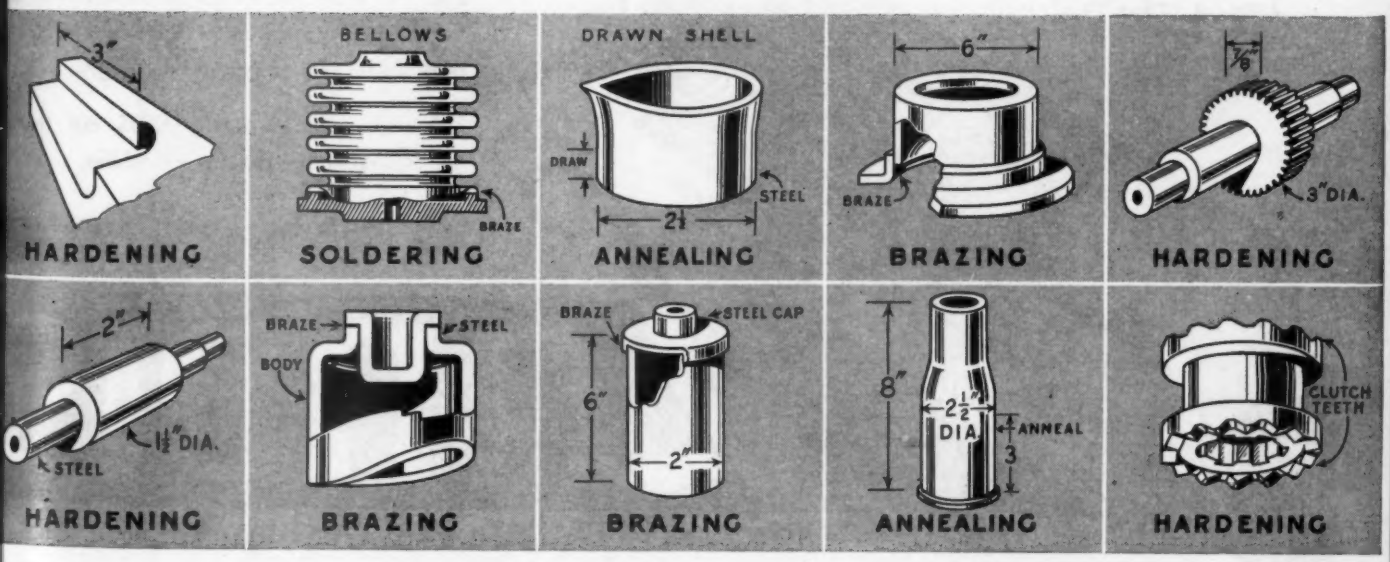
Because Van Norman Induct-O localizes heat to a specific area or portion of metal it not only simplifies the heating operation but completes most jobs in seconds instead of minutes or hours. In addition, it eliminates the necessity and expense of heating the entire part. The ease of operation makes it possible for practically any ordinary worker to operate the machine, and since the entire heating operation is automatic, part after part is turned out with identical characteristics. A few of the various operations performed on Van Norman Induction Heating Equipment are shown below.

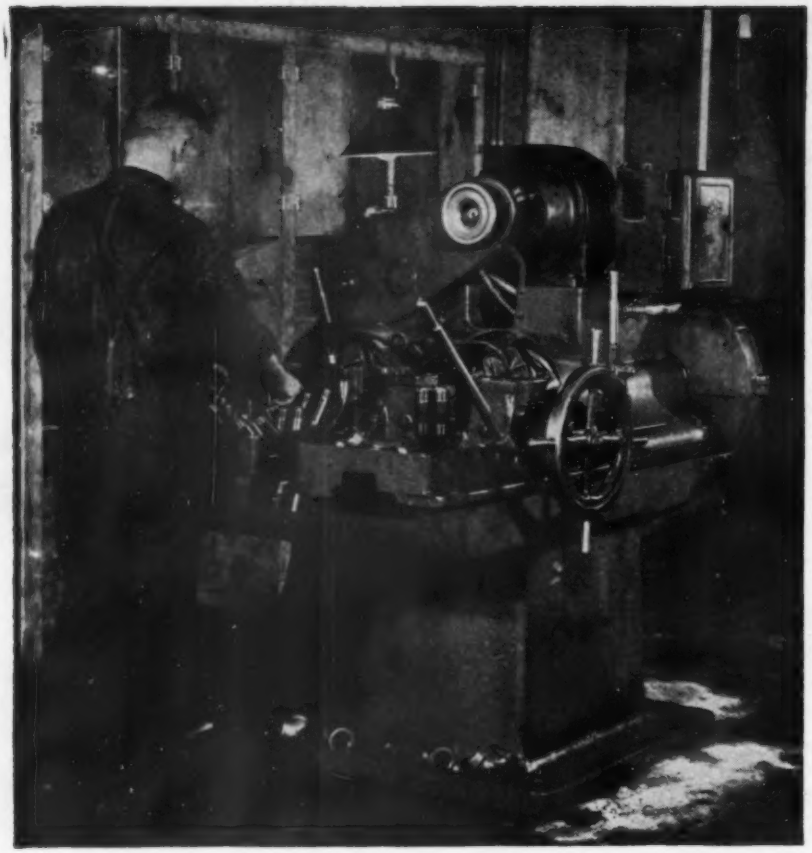
Get the story on the Van Norman Induct-O, today. See how you too, can use high frequency induction heating.

VAN NORMAN COMPANY

ELECTRONICS DIVISION

SPRINGFIELD 7, MASSACHUSETTS





for . . . high operating efficiency-- low threading cost

DEPEND ON...

LANDIS PIPE AND NIPPLE MACHINES

The LANDIS Chaser

The finest Thread Cutting Tool in Industry

Landis Pipe and Nipple Threading Machines are used exclusively in a mid-western plant in the production of high pressure nipples.

The sturdy rigid construction of this equipment and its inherent qualities—fine accuracy and maximum productivity—assure the user the highest operating efficiency and lowest possible thread cutting costs.

The fine accuracy of LANDIS cut threads assure leak-proof piping assemblies.

Write for Bulletin No. D-84

LANDIS

THREADING MACHINERY · THREAD CUTTING DIE HEADS

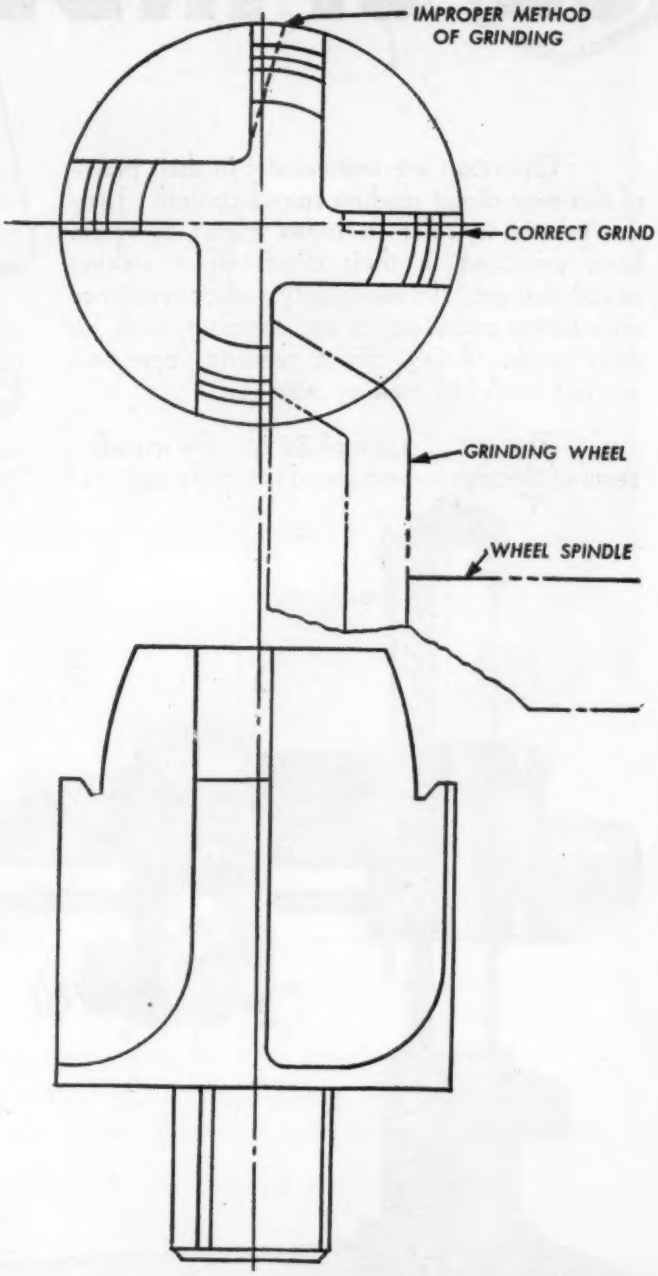
LANDIS

THREAD TIPS

A Good Mechanic Knows and Cares For His Machine

In the Interest of Efficiency, Better Workmanship and Higher Production

CORRECT AND INCORRECT RAKE GRINDS ON PIPE REAMERS



To produce a smooth ream and chamfer, Pipe and Nipple Machine Reamers should be ground correctly.

This chart illustrates the proper and improper methods of grinding, reaming and chamfering reamers.

LANDIS MACHINE CO. WAYNESBORO PENNA. U.S.A.

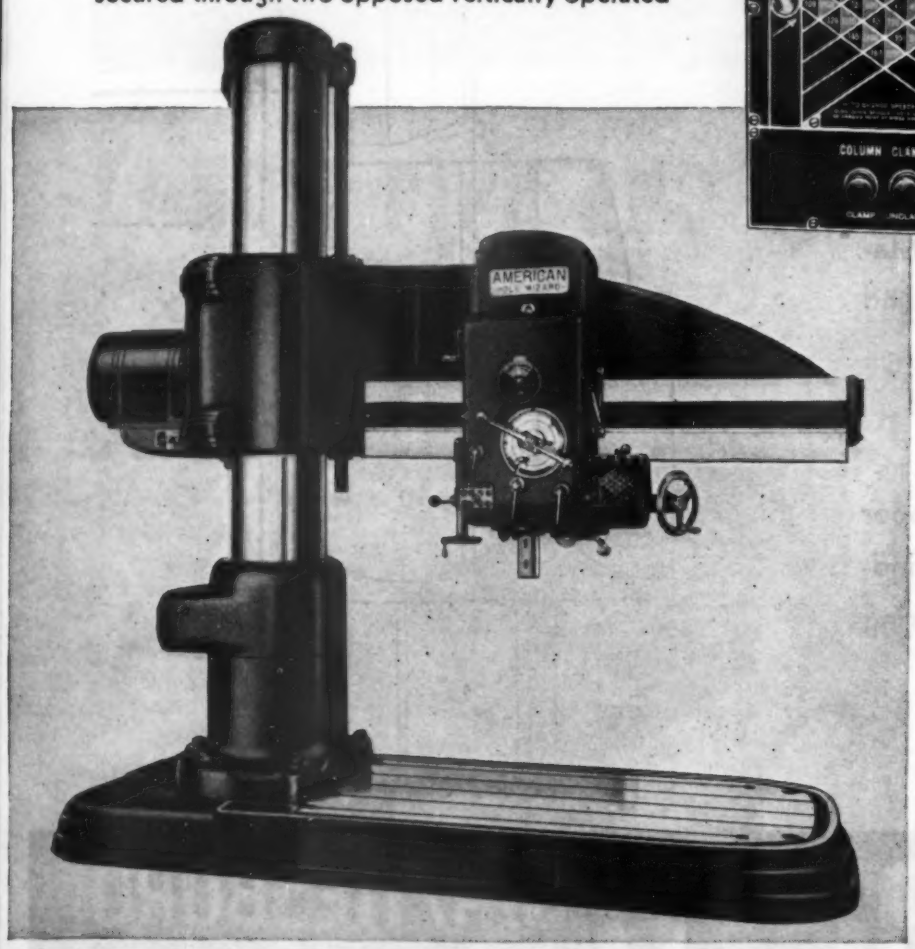
COLLAPSIBLE TAPS • PIPE THREADING AND CUTTING MACHINES

32 SPINDLE SPEEDS

...with only 2 Control Levers and 1 Back Gear Lever

Operators are enthusiastic in their praise of this new direct reading speed control. They don't have to refer to index plates or retain lever positions in their minds when making speed changes. Its superiority and convenience encourages operators to use correct speeds for their work. Being direct reading, operators are not fearful of making mistakes.

The entire range of 32 spindle speeds is secured through two opposed vertically operated levers which are direct reading and one two-position back gear lever used only when changing from the high to the low speed range or vice versa.



This new speed control makes work easier; increases production because of it and the payroll dollar buys more as a consequence.

This and other fine features of the "American" Hole Wizard Radial Drill are thoroughly illustrated and described by Bulletin No. 326.

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

All the facilities of the N. A. Woodworth Company are devoted to one purpose . . . The manufacture of precision tools and gages with the longest accurate life . . . To give users the lowest possible operating costs.

Reduce your production expense with sustained accuracy by Woodworth. Wire for stock list today.

ACCURACY YOU W CAN TRUST

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N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD · DETROIT 20, MICHIGAN

PRECISION GAGES · GROUND THREAD TAPS · FORM TOOLS · PRECISION MACHINED PARTS · HEAT TREATING · PLATING

DETROIT PUBLIC LIBRARY

LANDIS OFFERS YOU 36 YEARS OF CAM GRINDING EXPERIENCE

For the last several years the necessity for cam production has been at an all-time record high. Landis has contributed largely to this demand.

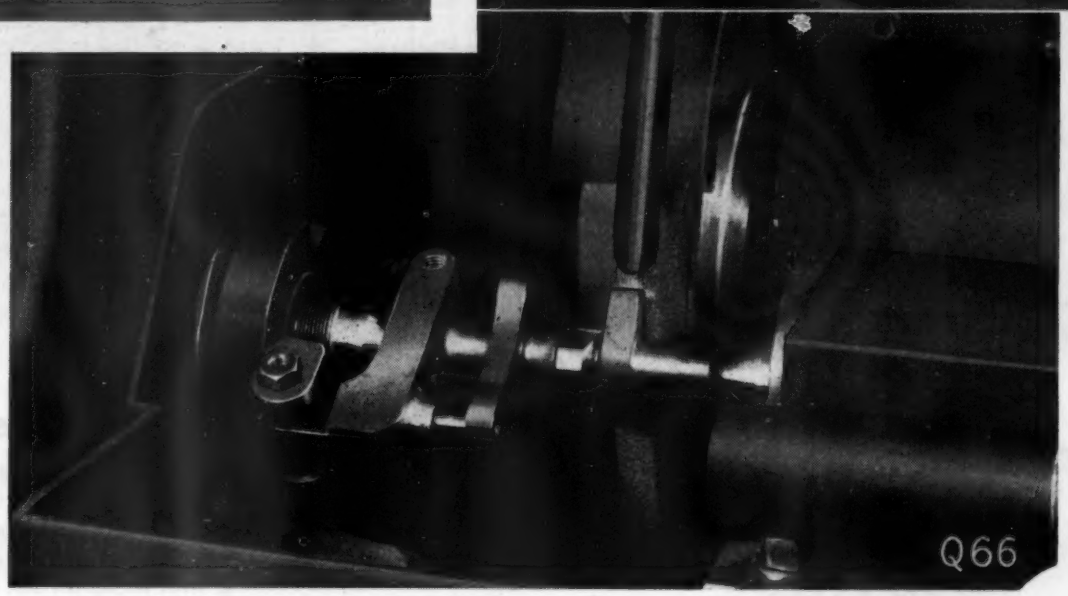
The accompanying illustrations show the grinding of several types of cams on Landis equipment. Fig. Q-25—A DISTRIBUTOR CAM is being ground. Figs. Q-63 and Q-64

Precision Grinders

LANDIS TOOL **LANDIS TOOL COMPANY**

CAMS · CAMS AND MORE CAMS

take their appointed places in the mechanisms of Victory



show the grinding of a CAM for PROPELLER PITCH CONTROL; Fig. Q-66 a FUEL INJECTOR CAM being ground. All of these cams are used in mechanisms of Victory.

Why not bring your cam grinding problems to Landis Tool? You are sure to profit from our long experience in the grinding machine field.

443-R

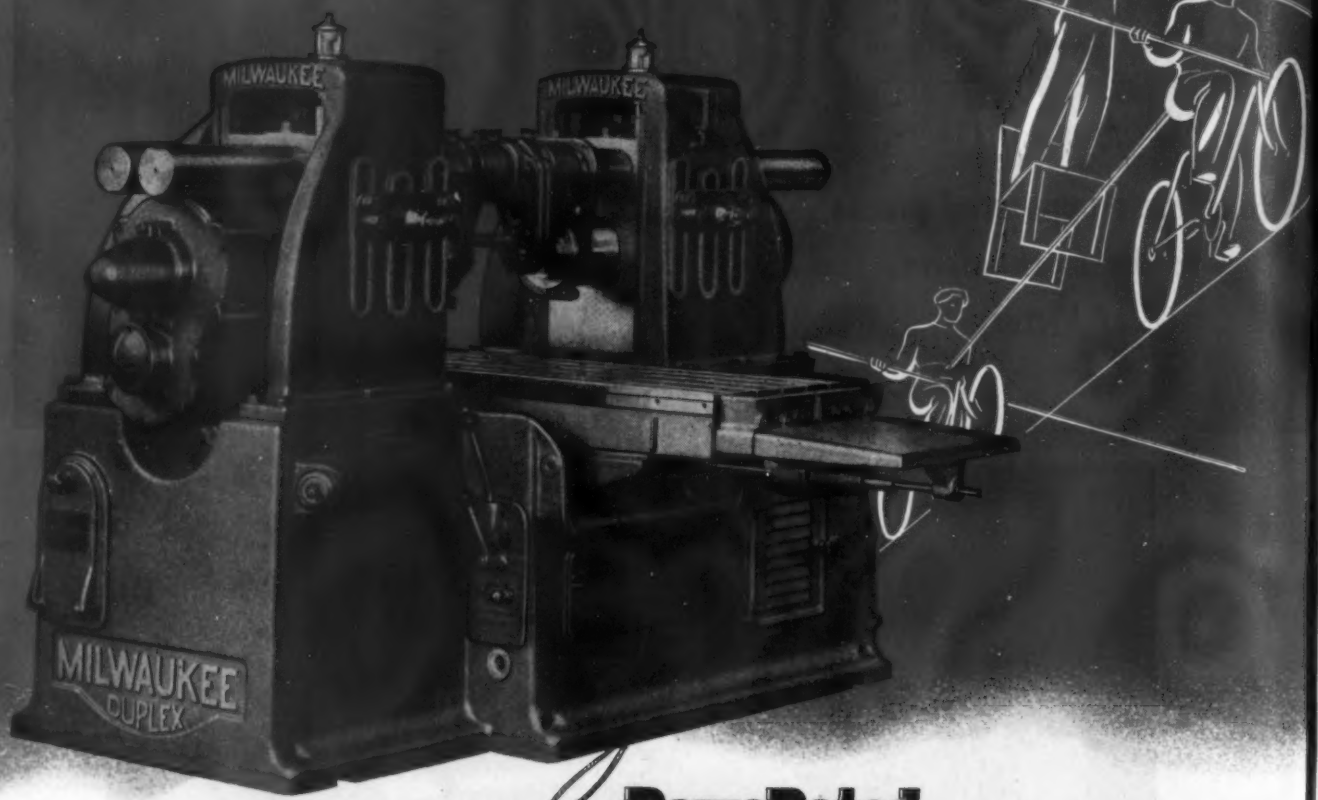
PRECISION GRINDERS · LANDIS TOOL · SINCE 1887 · UNIVERSAL RECOGNITION

LANDIS TOOL Company

WAYNESBORO · · · PA.

PoweRated

For **BALANCED POWER** *and* **PERFORMANCE**



PoweRated
Engineered for a Specific HP. Range

MEANS EVERY MILWAUKEE MACHINE IS POWER ENGINEERED TO DO THE JOB

Milwaukee *PoweRated* Milling Machines

- Standard Models — Horizontal, Vertical and Bed Types — available in Motor ranges from 3 to 25 HP.
- C.S.M. (Carbide Steel Milling) machines — 20 to 50 HP.
- Special Machines — Consult K&T engineers.

PoweRated ENDS THE WASTE AND HIGH COST OF "MONGREL" MACHINE TOOLS

Sound machine tool design demands thorough consideration of the motor hp. A No. 2 milling machine, for example, is designed and built in keeping with its motor hp. — plus the normal overloads to be expected in relation to the size of work to be milled.

Substituting a higher hp. motor to gain power and speed above that of the motor normally specified for a No. 2 milling machine results in a "mongrel" machine, incapable of sustained precision performance — as well as of doubtful value in terms of providing additional production in keeping with its "extra" cost. The power is excessive and out of balance with the design and construction of a No. 2 and its proper range of performance.

Milwaukee Milling Machines are power-engineered — *PoweRated* — each machine has a specific hp. rating in relation to the type of jobs to be milled.

When you are considering the purchase of a milling machine—think in terms of motor hp. for heavy cuts, range for light cuts. Check the advantages of Milwaukee *PoweRated* machines.

KEARNEY & TRECKER CORPORATION
MILWAUKEE 14 WISCONSIN

Back the Attack! **BUY MORE BONDS**

Milwaukee Machine Tools

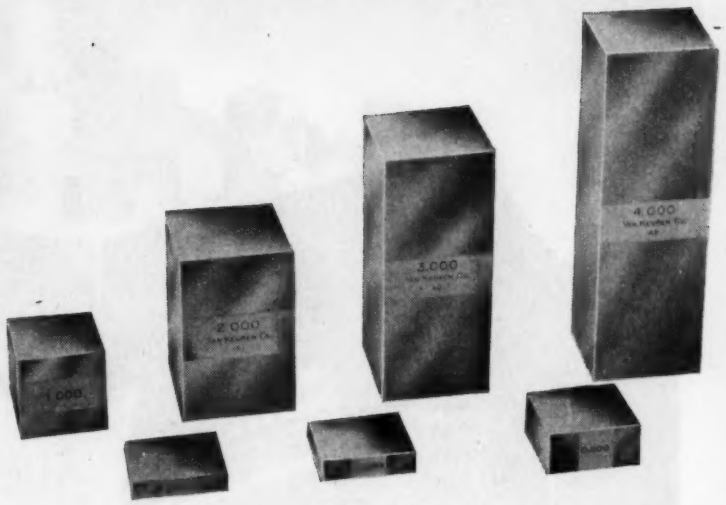
Announcing Van Keuren

SOLID SQUARE MASTER BLOCKS

★

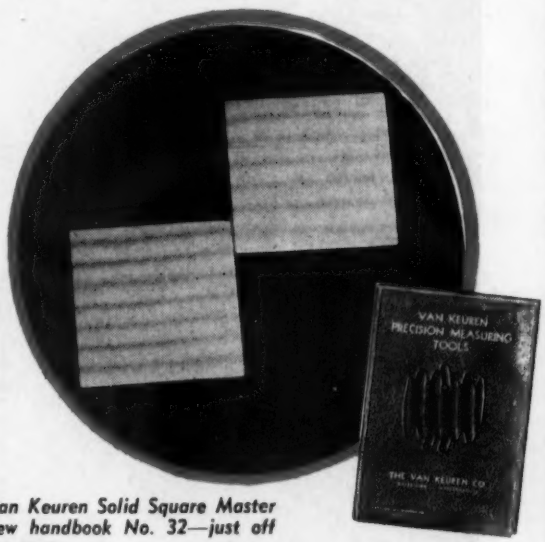
NEW DESIGN
ULTIMATE ACCURACY
IDEAL STANDARDS

★



VAN KEUREN Solid Square Master Blocks are the result of 25 years of experience in the manufacture of precision gage blocks. The new design provides for all requirements of a perfect gage block. Gages up to 1" in length are 1" square. The 2", 3", and 4" gages are 1¼" square. They have 2¼ times the wearing surface of rectangular blocks. They are made solid—that is without a hole through the center—because the best part of the gage remains available for use. The very dense and hard material laps only 1/3 as fast as ordinary gage block steel. A useful life of at least six times that of ordinary gage blocks will be realized.

Your next set of gage blocks should be Van Keuren Solid Square Master Blocks. They will speed victory production and establish the quality of post war products. A limited number of 85 block sets are now ready for distribution. Write for quotation and exact delivery date on your set.



Comparison of two Solid Square Master Blocks for length, flatness, and parallelism with light waves. Note the straightness, parallelism, and even spacing of the bands on both blocks showing perfection well within the guaranteed accuracy of 4 millionths of an inch. These blocks are ideal standards for making measurements with light waves.

The complete story of Van Keuren Solid Square Master Blocks is told in our new handbook No. 32—just off the press. Write for your copy.

Van Keuren

25th YEAR

THE VAN KEUREN CO., 176 WALTHAM ST., WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles

ARMSTRONG

They still don't know the capacity of an ARMSTRONG TOOL HOLDER

War urgency has led to a phenomenal stepping-up of speeds and feeds on lathes, planers, slotters and shapers. Some operations are now being done on the same equipment in half or even less the time which was thought to be "required" in prewar days. Still in no case have they reached the ultimate capacity of their ARMSTRONG TOOL HOLDERS.

So designed that the machine with greatest efficiency, with greatest convenience, maximum clearance, maximum visibility . . . with simple, inexpensive cutter-bits any mechanic can quickly grind from stock shapes of high speed steel, ARMSTRONG TOOL HOLDERS still have strength beyond any need, have capacity beyond that of the machine tools on which they are used.

For more production per man and more pieces per machine, tool completely with ARMSTRONG TOOL HOLDERS. Keep up with war time requirement; be equal to the speeded-up post-war competition.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
319 N. Francisco Ave., Chicago 12, U.S.A.
Eastern Warehouse & Sales Offices:
199 Lafayette St., New York 12, N. Y.

Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

G-E thyratrons pull the trigger when phototubes spot a bad bean in Electric Sorting Machine Co. units

DAILY, in four Michigan plants, 510,000 pounds of beans are sorted with the aid of G-E electronic tubes that never fail to do their part in preventing bad beans from passing on to the packing stage.

Beans to be sorted are fed onto a drum and held over tiny apertures around its circumference. A mechanical patter positions the beans for inspection by the sorting eye—the phototube. The marketable white beans get the high sign. With the discolored ones it's thumbs down . . . for when their dark skin fails to reflect the light beam, the phototube tells the G-E thyratron tube which picks up the signal, sets a tripper, and a mechanical finger flips the rejects into the discard.

Thus, in another industrial process, speed and accuracy replace tedium and error—through "the inspector that never tires": the electronic tube.

G-E electronic tubes also work at counting, grading, maintaining register in printing and papermaking, detecting pinholes in sheet metal, opening doors, setting off burglar alarms, actuating safety devices.

There is a complete line of G-E electronic tubes for innumerable industrial jobs; and near you is a G-E electronic tube distributor who is prepared to fulfil your requirements.

"HOW ELECTRONIC TUBES WORK"

This booklet will be mailed to you on request—without charge. Address *Electronics Department, General Electric, Schenectady, N. Y.*

• *Tune in* "The World Today" *and hear the news direct from the men who see it happen, every evening except Sunday at 6:45 E.W.T. over CBS. On Sunday listen to the G-E* "All Girl Orchestra" *at 10 P. M. E.W.T. over NBC.*

G. E. HAS MADE MORE BASIC ELECTRONIC-TUBE DEVELOPMENTS THAN ANY OTHER MANUFACTURER

GENERAL ELECTRIC

162-C7-8850

OHIO HORIZONTAL
BORING, DRILLING AND MILLING MACHINES

Orders for Ohio Horizontals are being shipped with reasonable promptness.

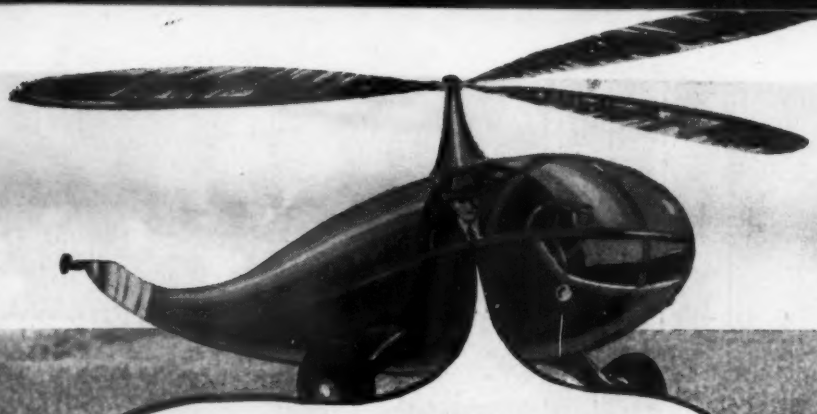
Ohio's portable control (which can be ordered for the machine shown above) is a demonstrated time-saver, simplifying and speeding up many an otherwise unprofitable job.

The power, precision and convenience traditional in Ohio Dreadnaughts are promoted by such features as these: unit construction, nitrided spindle, anti-friction bearings, built-in electrical power rapid traverse, narrow guide construction for all moving parts, push-button control for start-stop, forward-reverse and run-jog of the spindle, continuous spindle feed of 72" with full-length spindle support, internal gear-tooth type clutches, automatic lubrication, multiple-splined shafts with splines milled from the solid for all sliding gears and clutches. Heavy duty and extra heavy duty models, floor and table types, 5" and 6" spindle sizes . . . We also offer a full range of accessories.

Get our well illustrated Bulletin 300

THE OHIO MACHINE TOOL COMPANY • KENTON, OHIO

OHIO DREADNAUGHT
HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS



YOU WOULDN'T BELIEVE IT BUT THIS CORNFIELD WAS ONCE A WAR PLANT.

THE PLANTS THAT HAVE BETTER TOOLS WILL NOT GO BACK TO CORNFIELDS

No matter what the post-war national income may be, the plants with better products and lower costs will not go back to cornfields. Because nobody can buy materials or labor much cheaper than his competitors, the only remaining way to lower costs is to cut them with better plant layout and special time saving tools.

Vulcan production engineering, tool designing and building service can be of great help to those who want their vision of post-war tools converted into blue prints — perhaps into metal — *before* competition gets a head start.

Write for the Vulcan brochure on "Post-War Economy" illustrated here; and let's get acquainted now.

The VULCAN TOOL Co.

213 NORTH BECKEL STREET DAYTON 3 OHIO

ENGINEERING · DESIGNING · BUILDING · GAUGES · TOOLS · DIES · JIGS · SPECIAL MACHINERY

SAVING 215 GALS OF CUTTING OIL DAILY

. . . With One Tolhurst "Chip Wringer" at the Pyle National Company

WRINGING 4 TONS OF CHIPS IN 4-5 HOURS DAILY, this busy Chicago plant processes the turnings from 11 automatic screw machines and 1 thread miller in one Tolhurst "Chip Wringer." Result—125 gallons of fresh cutting oil from 2 tons of brass chips; 90 gallons from 2 tons of steel chips. Tolhurst "Chip Wringers" recover as much as 98.6% of the cutting oil—*by centrifugal force only.*

INCREASING SCRAP VALUE OF CHIPS, by wringing them is another saving to Tolhurst users. Dry chips from the wringer are normally ready for remelt and re-use.

A FRESH SUPPLY OF CUTTING OIL, always available, encourages a conscientious use—and *reduces tool wear.* As much as 50% increase in tool life has been shown by toolroom records after installing Tolhurst equipment.

OPERATED BY UNSKILLED HELP, Tolhurst "Chip Wringers" present a real economy. The routine is simple and rapid, enabling a plant to keep its floors clean and thus *reduce fire and accident hazards.*

Descriptive bulletins, installation data and prices are available on request.

TOLHURST CHIP WRINGERS

TOLHURST CENTRIFUGAL DIVISION • *American Machine and Metals, Inc., East Moline, Illinois*

"Since 1852 — CENTRIFUGAL MAKERS FOR THE PROCESS INDUSTRIES"

GOOD THINGS AHEAD

It is reported that:

The world's most powerful electric motor has recently been completed. Developing 7,000 horsepower at only 25 r.p.m., it is said to be capable of lifting an entire four stack destroyer at the rate of 200 feet per minute.

get ready with CONE for tomorrow

A new resin dip for small metal parts feels like rubber, protects the part, strips easily by hand and may be re-used.

get ready with CONE for tomorrow

A new invention consists of a panel that hangs over a bed and is a source of radiant energy. Properly adjusted to the sleeper's metabolism and length of slumber, it is expected to give him the equivalent of a full night's sleep in as little as two hours.

get ready with CONE for tomorrow

The rare metal, indium, is being used as a tarnish-proof plating for gold and silver and is being used as an alloy in bearing metal and solder.

get ready with CONE for tomorrow

A new chemical does most of the work of the dangerous hydrofluoric acid without danger to the human skin.

get ready with CONE for tomorrow

The new plastic-coated fabrics will be water-proof and abrasion-resistant and may be flexed for a long time before cracking. They will be useful materials for baby carriages, auto tops, furniture, bus seats, shoe tips, raincoats, luggage, shower curtains and handbags.

get ready with CONE for tomorrow

Even the high-pressure cylinders used to hold compressed gases are now being made by stamping and drawing.

get ready with CONE for tomorrow

A colored surface .0001 inch thick, applied to the surfaces of gages does not affect their accuracy, but warns of wear by a change in color.

A national producer's council hopes to reduce the cost of home building by 20% by promoting more modern building codes and labor regulations.

get ready with CONE for tomorrow

The by-products of sawdust have become so valuable that some sawmills are using coal for fuel.

get ready with CONE for tomorrow

A prominent scientist states that it may take twenty years to utilize fully the scientific discoveries made since Pearl Harbor.

get ready with CONE for tomorrow

A synthetic shellac made from corn is expected to permanently replace the natural product which is made from the secretions of an insect found in India.

A large manufacturer of farm machinery proposes to enter the peace-time farm market with a line of refrigerators and cold storage lockers.

get ready with CONE for tomorrow

A new low-temperature grease permits aerial cameras to operate at temperatures as low as 100 degrees below zero.

get ready with CONE for tomorrow

A French automobile manufacturer expects to make a small, economical car for the American post-war market.

get ready with CONE for tomorrow

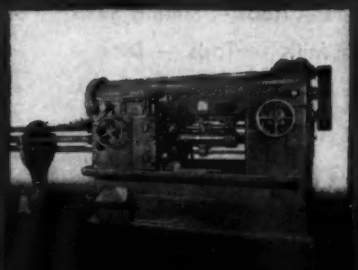
A maker of paper parachutes, for dropping supplies to troops, expects to continue their manufacture after the war for use in the air delivery of mail and light-weight express.

get ready with CONE for tomorrow

The world's shortest firing range, only twenty-two feet long, duplicates the air pressure and temperature of the stratosphere.

Here is performance that is definitely AHEAD

This part calls for extreme accuracy and yet requires wide forming cuts on a variety of diameters. In one position an attachment taps an inside thread 5/16"-18 while, at the same time, a die cuts an outside thread 5/8"-[illegible] 27. Produced on the 6 Spindle Conomatic at the rate of 12.5 seconds per part.



CONE

AUTOMATIC MACHINE CO., INC. • WINDSOR, VERMONT, U. S. A.

because they can be depended on for

ECONOMY, EFFICIENCY *and* SPEED

All the essential performance qualities demanded in small tools today are met in UNION TOOLS.

Faster cutting, longer life between grinds, accuracy and all-round better performance of these tools are matters of common recognition in plants busy on war work where small tools are subjected to the most exacting service conditions.

You, too, can depend on UNION TOOLS for your requirements. Try them once and you'll use them regularly.

THE UNION LINE

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies — Screw Plates — Profile Cutters.

●

UNION TWIST DRILL COMPANY, ATHOL, MASS.

STORES—New York: 61 Reade St., Chicago: 11 So. Clinton St., Detroit: 6540 Antoine St., San Francisco: 121 Second St., Los Angeles: 524 E. Fourth St., Seattle: 568 First Ave., South.

MANUFACTURING DIVISIONS

S. W. Card Mfg. Co. Div., Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
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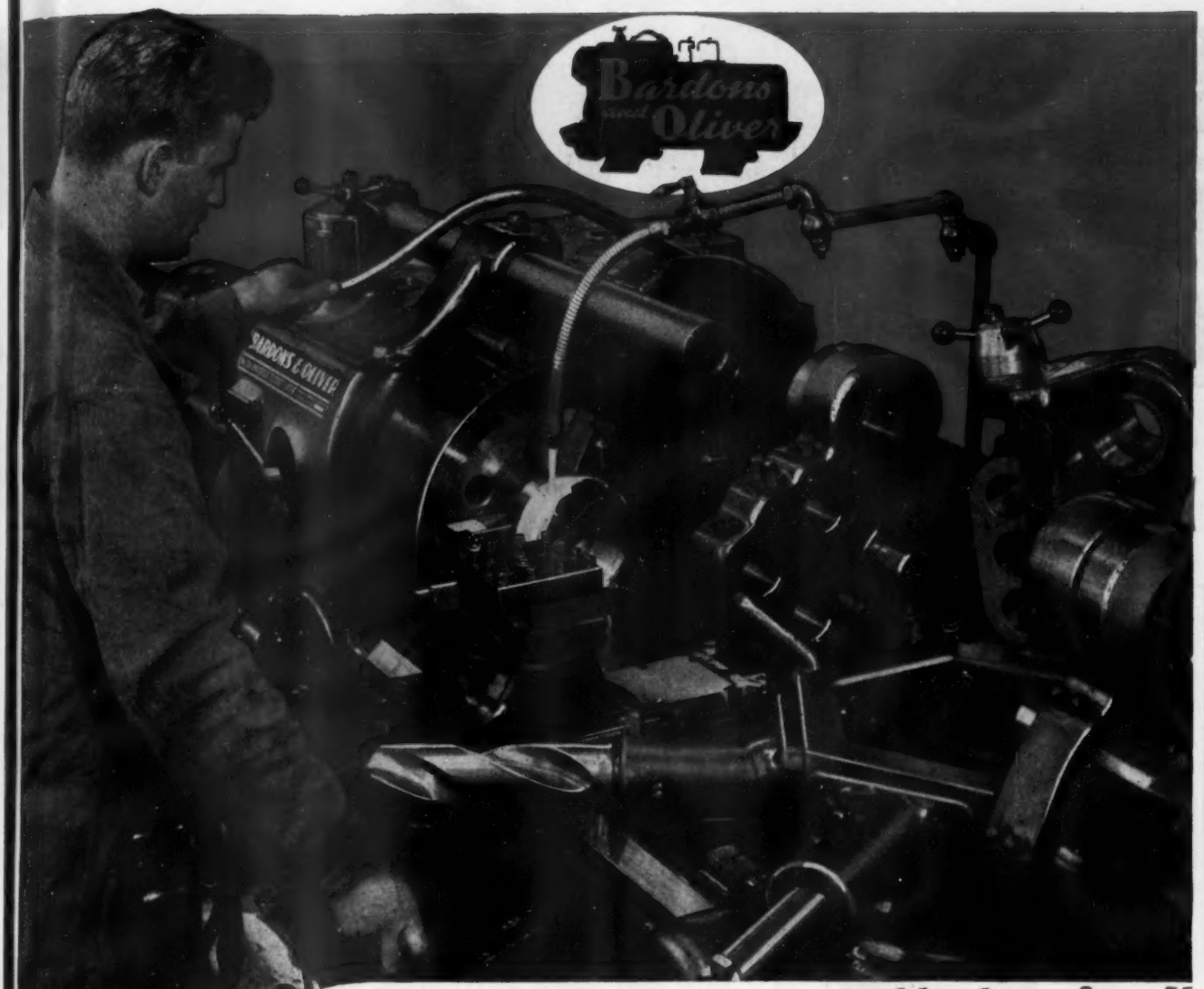
UNION



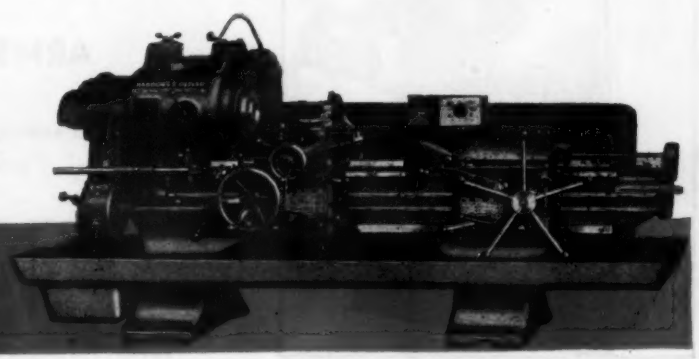
CHANGING THE SPINDLE SPEED *Hydraulically*

Requires merely a gentle pressure on the control lever. Thus this operator is able to turn out a full day's production of alloy steel gear blanks and yet conserve his energy.

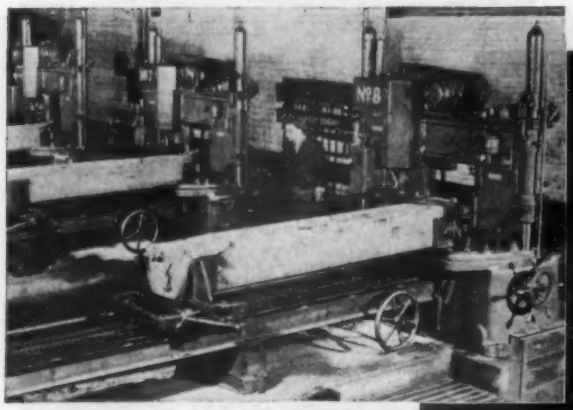
By easy motions of his left hand on the control lever the operator can start, reverse or stop the spindle, or change to any of the twelve available speeds. A powerful hydraulic brake applied in the neutral lever position brings the spindle to a rapid stop. An automatic lever lock prevents accidental starting.

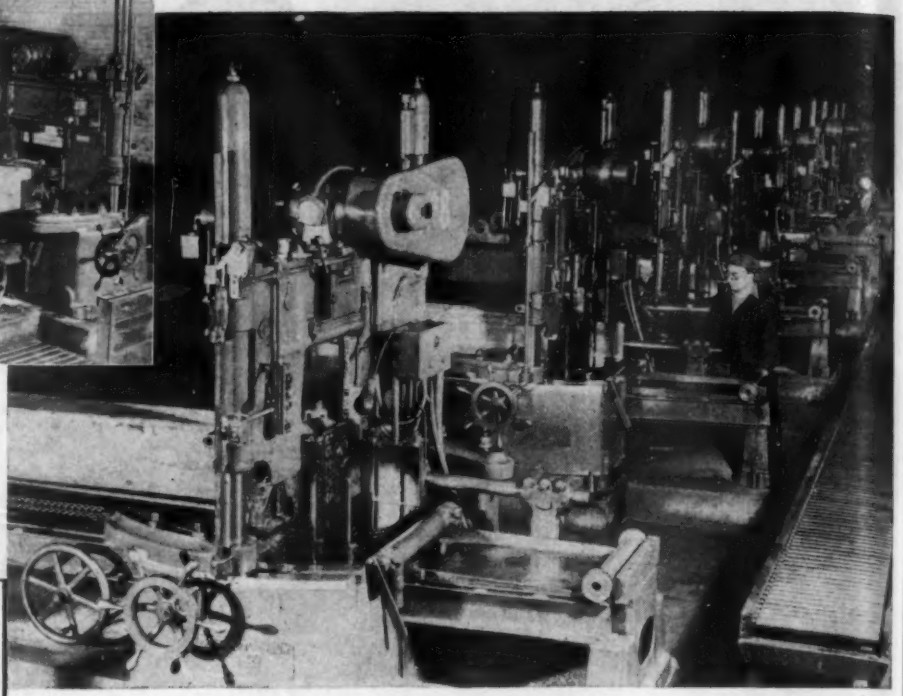
BARDONS & OLIVER NO. 21 SADDLE TYPE UNIVERSAL TURRET LATHE is powerful, rigid and capable of high production. Yet it is outstandingly easy to operate.

Write for a catalog today.

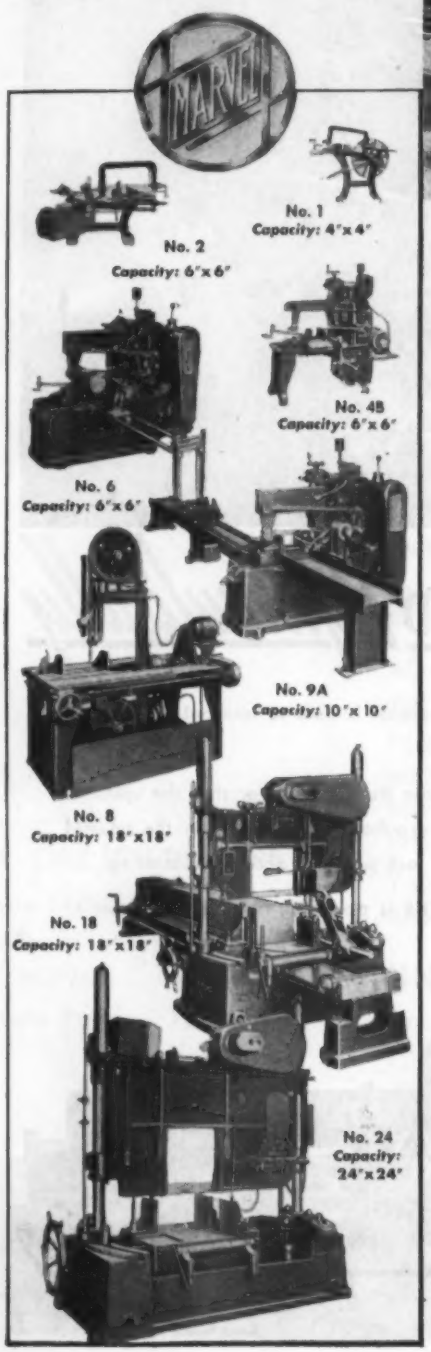


BARDONS & OLIVER, INC.
1133 W[illegible] 9TH STREET • CLEVELAND 13, OHIO





Part of the row of No. 18 MARVEL Giant Hydraulic Hack Saws used to crop and cut-off test slices for metallurgical tests for large billets of tough alloy steels.



MARVEL No. 18 Hydraulics 12 in a row!

When a greatly expanded steel plant, near Canton, Ohio faced the problem of cropping and cutting-off test samples from large alloy billets, in WARTIME quantities and at wartime speed, they checked the performance of all types of cutting-off equipment in all their other company plants, and selected MARVEL No. 18 Giant Hydraulic Hack Saws for this "tough" job.

Now this row of twelve MARVEL No. 18 Hydraulics shown above, operating continuously, 24 hours a day on tough alloy billets of from 14" to 16" cross section, handle this tremendous, heavy duty cutting-off job without a hitch and with a minimum of man hours—only four operators per shift.

When you have a cutting-off problem your most logical first step is to check with your local MARVEL Sawing Engineer for recommendations of methods and equipment.

ARMSTRONG-BLUM MFG., CO.

"The Hack Saw People"

5700 W. Bloomingdale Ave. **Chicago 39, U. S. A.**

Eastern Sales Office: 225 Lafayette St., N. Y. 12.

MARVEL SAWS

The full hydraulic action of the Thompson No. 120 Grinder applied to advantage in the production of parts for Anti-aircraft Guns at a mid-western plant.

Aircraft Master Rods being ground to ultra precision on the Thompson Grinder. Photo from a prominent eastern plant.

A western aircraft plant grinding yoke ends of terminal forgings to close limits of accuracy on the Thompson Grinder.

Control parts for modern war planes being produced on the Thompson No. 1 Hydraulic Surface Grinder.

TYPICAL EXAMPLES OF

Successful

WARTIME GRINDING OPERATIONS

Manufacturers do rely on Thompson . . . for precision . . .for speed. . .for the rough and finish grinding of various types of war equipment and "close-tolerance" aircraft parts at top rates of production. At the left are four illustrations (from four separate plants) of typically successful war-production set-ups on Thompson Grinders. Each of these applications indicates the Thompson Grinder's adaptability for high speed output, for ultra precision, for quality finishes. Full details upon request.

Thompson Grinders

THE THOMPSON GRINDER COMPANY

SPRINGFIELD, OHIO

1

CYLINDER HEAD

2

ARTICULATED ROD

3

MASTER ROD

4

PISTON

5

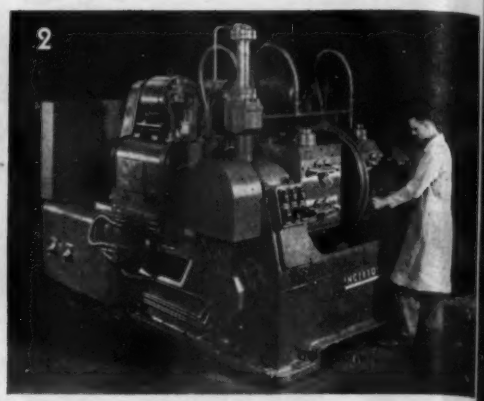
CRANKSHAFT

6

CRANKCASE

INGERSOLL *Special Machines for Aircraft Motors...*

1



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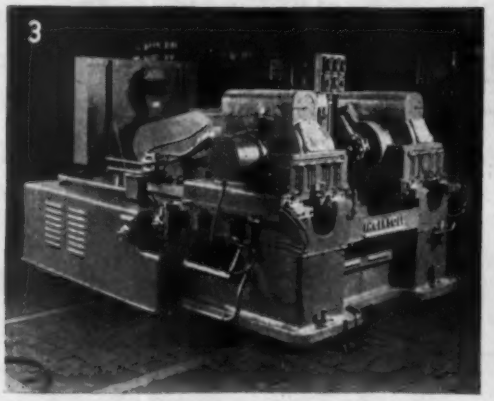

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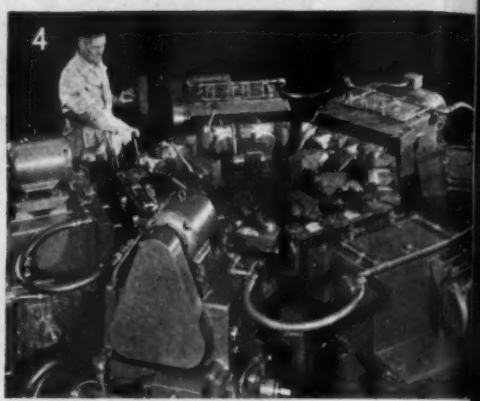

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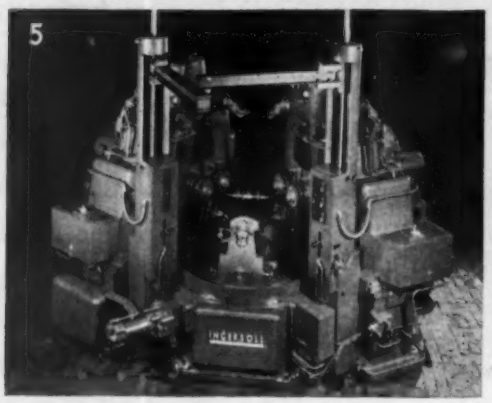

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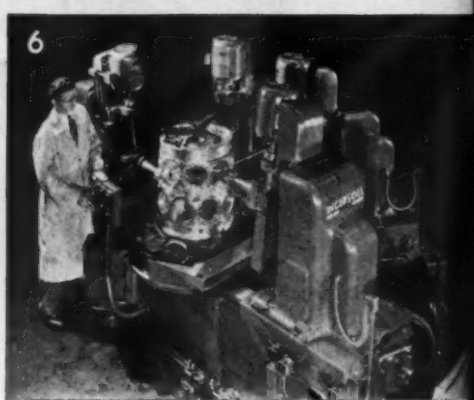


6

These six different engine parts are now being machined on groups of special Ingersoll's like those shown. Unlike any automotive machinery in design and appearance, they are like it in principle because they increase the production previously obtained with standard machinery, and at the same time greatly reduce the number of operators required.

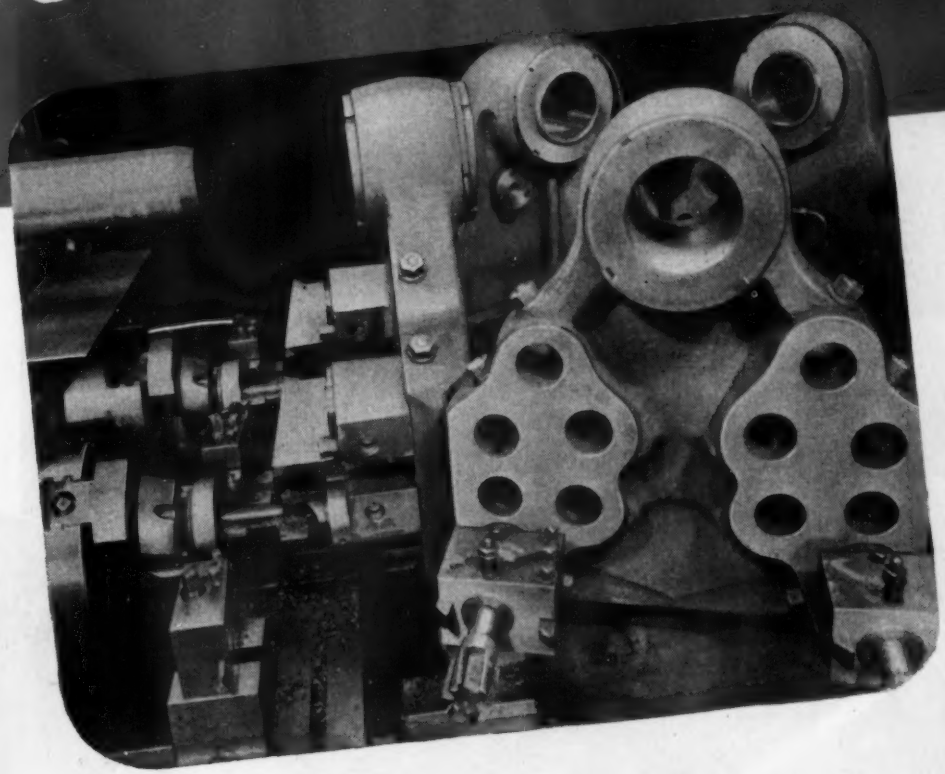
THE INGERSOLL MILLING MACHINE CO.

ROCKFORD, ILLINOIS

Step from PRE-WAR to POST-WAR WORK through P&J RE-TOOLING

. . . from TRACTOR PARTS

Tooled for the job with the set-up shown here, a P&J 5-D Two Spindle POWERFLEX produced 23 malleable iron tractor track roller shaft brackets in 51 minutes. Floor-to-floor time was 4.1 minutes.



. . . to almost any part

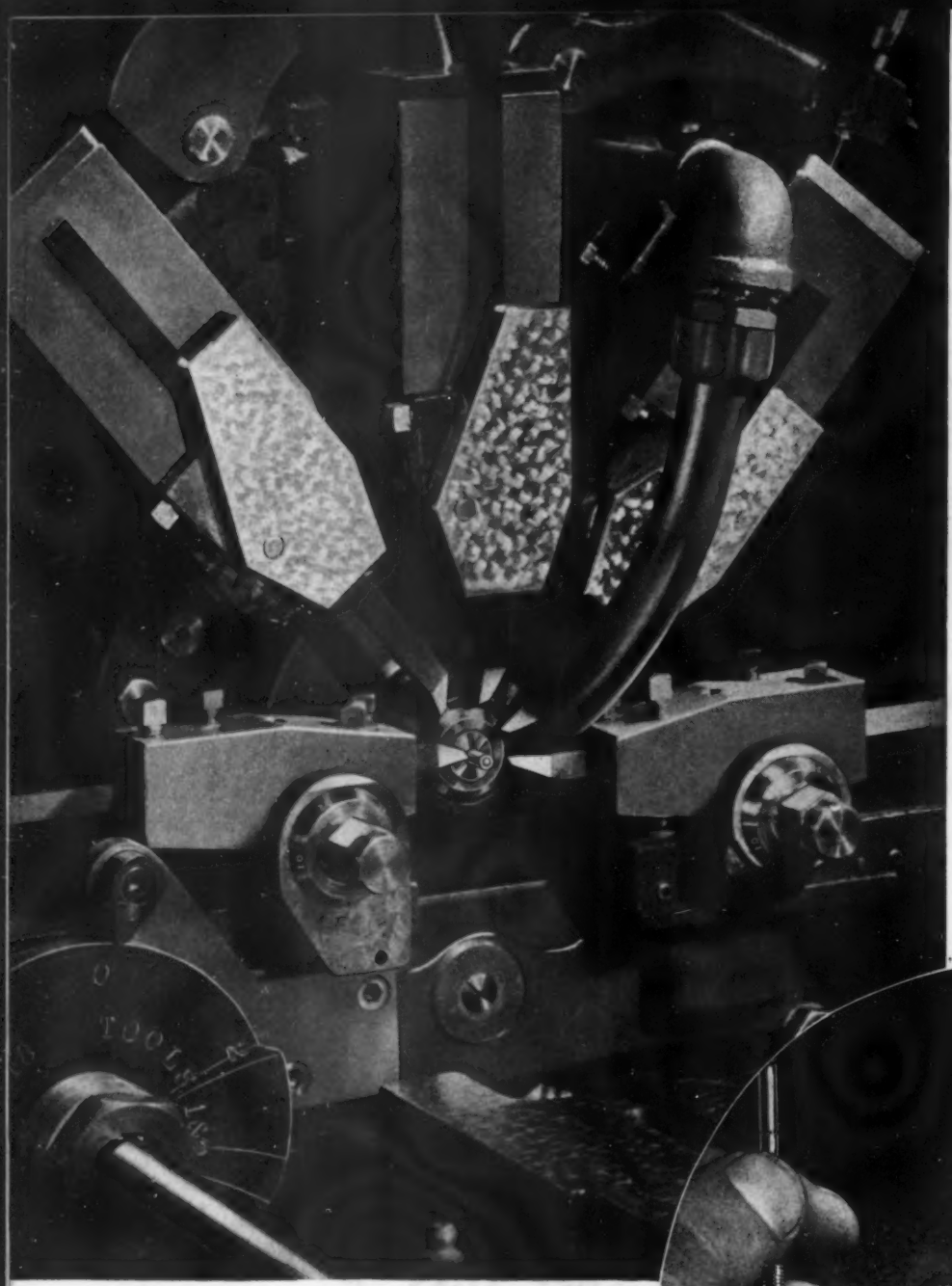
This same P&J machine, originally tooled for producing tractor parts, provides all the modern basic features to assure speed, accuracy, convenience and economy in the machining operations that will be called for in post-war work. By merely RE-TOOLING, it can be converted to handle the new job. Consultation with P&J engineers is invited on your RE-TOOLING problem. It will pay you to let us apply our tooling experience to your post-war needs. You know the parts you'll want to produce — we know the conversion possibilities of P&J machines. Let's work out the details together and see exactly what P&J RE-TOOLING SERVICE can offer you. Now is a good time to get our heads together.

POTTER & JOHNSTON MACHINE CO.,
Pawtucket, R. I.

P&J REBUILDING SERVICE

Present owners of P&J Automatics are invited to investigate the re-building facilities available in the P&J plant as a means of restoring machines to original productivity and accuracy. Re-tooling also can be conveniently handled at the time of rebuilding.

Our boys need your BONDS . . . BUY NOW



You need

GIBBS

HIGH SPEED AUTOMATICS

for ultimate PRECISION and PERFORMANCE in any material including stainless steel, pure nickel and pure copper.

SAVE SECOND OPERATIONS on any screw machine products that require extreme tolerances in 'tenths' combined with fine finish, particularly on thin work exceeding in length 2½ times the diameter.

THE 5 RADIALLY FED TOOL BITS

form the part in front of a bushing, through which the rotating stock is passed. The exact form is generated by a combination of in-feed and ongitudinal feed, not by form or box tools.

A wide range of spindle speeds is provided to take full advantage of tungsten carbide cutters.

Write for complete information and request the visit of our screw machine consultant to analyze your parts — without obligation to you.

GIBBS 375M AUTOMATIC COMBINATION PRECISION TURNING AND HOBBING.

GIBBS 375M COMBINATION AUTOMATIC TURNING, MILLING AND CROSS-DRILLING.

GIBBS CARBIDE PRECISION TOOL GRINDER

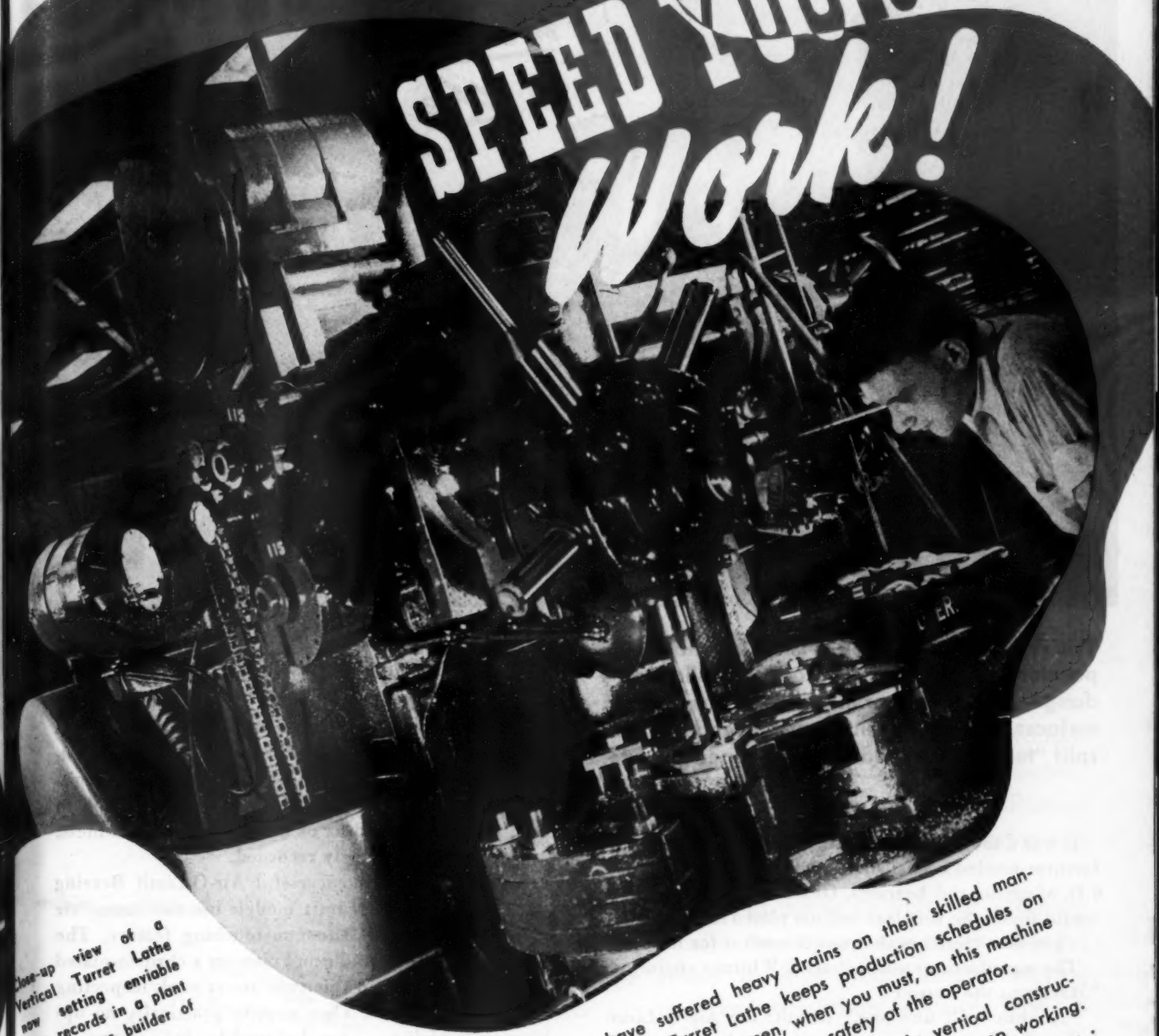
GEORGE SCHERR CO., INC.

Eastern Sales and Service

202 LAFAYETTE ST., NEW YORK 12, N.Y.

Protect your workers and

SPEED YOUR *Work!*



Close-up view of a Vertical Turret Lathe now setting enviable time records in a plant of a famous builder of airplane engines.

Even in plants which have suffered heavy drains on their skilled manpower, the Bullard Vertical Turret Lathe keeps production schedules on the go. For it's easy to break in new men, when you must, on this machine which, built for speed, is yet designed for the safety of the operator.

Accuracy comes naturally from the "Bullard's" sturdy vertical construction. With the multiple tooling on two heads, the V.T.L.s keep working.

In every field of manufacturing, for war work or civilian essentials . . . they'll beat your production schedules, but they're easy on your men.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

This Pratt & Whitney Air-O-Limit Internal Comparator avoids actual contact . . . eliminates danger of scratches or marrings of fine finished surfaces . . . gives instant, accurate readings that split "tenths" . . . speeds up I.D. inspection rate.

• • •

It was a tough problem. An airplane engine manufacturer needed a safe, sure way to inspect the critical I.D. of master-rod bearings. Ordinary gaging methods would touch the soft lead-indium plated inner surface . . . produce scratches that would spoil it for use.

The manufacturer asked Pratt & Whitney engineers, "Have you the answer?"

"No, but we'll find one." Result: the Air-O-Limit Internal Comparator . . . extremely simple in construction and operation . . . but it took the accumulated years of P&W "know-how" and experience and skill to produce it quickly.

Here's how it works. The bearing to be inspected is placed on a sliding V-block mounting and slipped over the gaging spindle . . . there is a slight clearance so that *it does not actually touch.* This spindle has two tiny opposite nozzles through which compressed air is forced. The amount of back pressure caused by limiting the discharge of air through the nozzles is registered on a precision pressure indicator calibrated to read in ten-thousandths of an inch. Size, roundness, and taper are unerringly recorded.

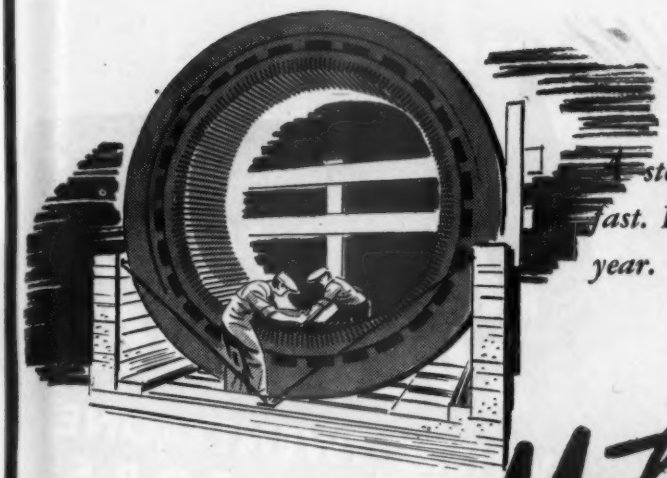
This is the highly successful Air-O-Limit Bearing Gage. Other Air-O-Limit models use the same "air principle" but omit the non-touching feature. The piece slips on the spindle and rests on a chrome-plated surface. Hundreds of this type are at work inspecting fine tolerance parts. They require practically no upkeep or servicing . . . are designed for long wear.

One more typical Pratt & Whitney contribution to the speeding up of America's mighty war production . . . one more contribution to peacetime mass production. Ask for information.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD, CONNECTICUT, U. S. A.



A steel company needed a special 2000 hp motor fast. Delivery of a new motor would take at least a year. Here's what Westinghouse M&R did about it.

25-Ton Motor Rewound

TO START STEEL PRODUCTION MONTHS SOONER

A used motor was located which could be adapted for this application. But it was wound for 2400 volts. Voltage required was 3800. This meant designing and furnishing an entirely new winding.

To complicate the rebuilding problem, the motor and bedplate weighed 50,000 pounds. But weight and size didn't bother the Westinghouse *Manufacturing and Repair** Plant assigned to handle the job.

Both the stator and rotor were completely rewound. Twelve-inch bearings were rebabbitted and rebored, and the entire motor rebuilt as good as new. Prompt delivery saved months in getting the customer's production under way.

Jobs like this are all in the day's work for Westinghouse M & R Plants—a nationwide chain of local repair shops ready to give you prompt service on reconditioning or rebuilding of any type of electrical equipment.

J-90520

WESTINGHOUSE PRESENTS
... JOHN CHARLES THOMAS
SUN. 2:30 EWT., NBC.
"TOP OF THE EVENING"
MON. WED. FRI. 10:15 EWT., BLUE NET.

When vital electrical equipment needs repair... phone the nearest office of Westinghouse Electric and Manufacturing Company for

Westinghouse

COMPLETE REPAIR SERVICE

***33 M & R PLANTS • • ONE NEAR YOU**

THIS WHEEL SUCCEEDED ...WHERE TWENTY-ONE COMPETITORS Failed!

THIS 7 x ½ x 1¼ MID-WEST SUPER-CUT wheel (2.100 IY6) tackled a grinding job 21 competing wheels failed to perform—and *exceeded* every specified requirement.

The job, called by our service engineer "the toughest grinding operation I've ever witnessed," involves removing between .010 and .011 inches of stock from each side of the inner slot of a counter weight forged from A-417 steel and having a Rockwell hardness of 58 "C" scale. The wheel, must operate from within a circle of counter weights chucked on an internal grinder. The slots, 3 inches long, .508 inch wide and 1½ inches deep, must be finished to not more than 20 micro-inches root mean square and free from all signs of burn!

Twenty-one competing wheels were submitted for pre-production trials. All of them loaded, glazed and heated the work. None of them would remove more than .002 stock.

THEN A MID-WEST SUPER-CUT (2.100 IY6) TURNED THE TRICK, REMOVING THE REQUIRED STOCK IN APPROXIMATELY TWO MINUTES OF GRINDING TIME, LEAVING A SURFACE FINISH OF BETWEEN 9 AND 10 R. M. S. AND SIDE WALLS PARALLELED TO WITHIN .0003 INCH! THE WHEEL SHOWED NO SIGN OF LOAD, ITS RADIUS AS SHARP AS AT THE START AND THE WORK'S TEMPERATURE HAD NOT BEEN INCREASED.

Naturally the production superintendent of that important war plant specified MID-WEST SUPER-CUT wheels for the counter weight grinding job. It will pay you to specify MID-WEST SUPER-CUT for grinding all hardened or unhardened alloy or high speed steels. Ask for a demonstration of MID-WEST superiority.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. Milwaukee Ave. Detroit 11, Mich.

HARDINGE Second Operation Machines mean better results without expensive tooling

For precision second operation work, the trend is to Hardinge. The initial low cost, the versatility and unusual capacity, without the set-up complications involved with large machines, created an ever-increasing demand for these machines.

The double tool cross slide and turret take standard tooling. The six-position tilted turret has an automatic indexing and locking head with six independent travel stops.

The illustration shows one of the groups of Hardinge Second Operation Machines in the production of precision aircraft parts at Moore & Steele, Owego, N. Y.

Specifications: 1" collet capacity, 6 " step chuck capacity, 5" jaw chuck capacity, 9" swing, eight spindle speeds up to 4000 r.p.m.

HARDINGE BROTHERS, INC.
ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

He Never Has to Take His Eyes Off the Cutter and Work

DEVLIEG JIGMIL

Spindle start, stop and reverse—

Power vertical feed and rapid traverse movement—

Power horizontal feed and rapid traverse movement—

Power automatic table retraction and repositioning—

Power feed and rapid traverse to bar movement—

are all carried in a master switch on the spindle head — at the operator's finger tips.

Thus, the operator of the DeVlieg Jigmil can fix his vision on the cutter and work—never has to look at controls during operation.

The Jigmil is what a machine tool should be—a powerful and accurate extension of the operator's hand. The value in precision boring and milling is apparent.

It's a NEW Type Machine

Spacing Accuracy of a Jig Borer . . . Performance Qualities of a Milling Machine . . . Convenience and Flexibility of a Horizontal Boring Mill.

New speed of operation . . . New standards of excellence of bored holes . . . New accuracy in milling . . . Automatic table retraction and repositioning dependable within .0002".

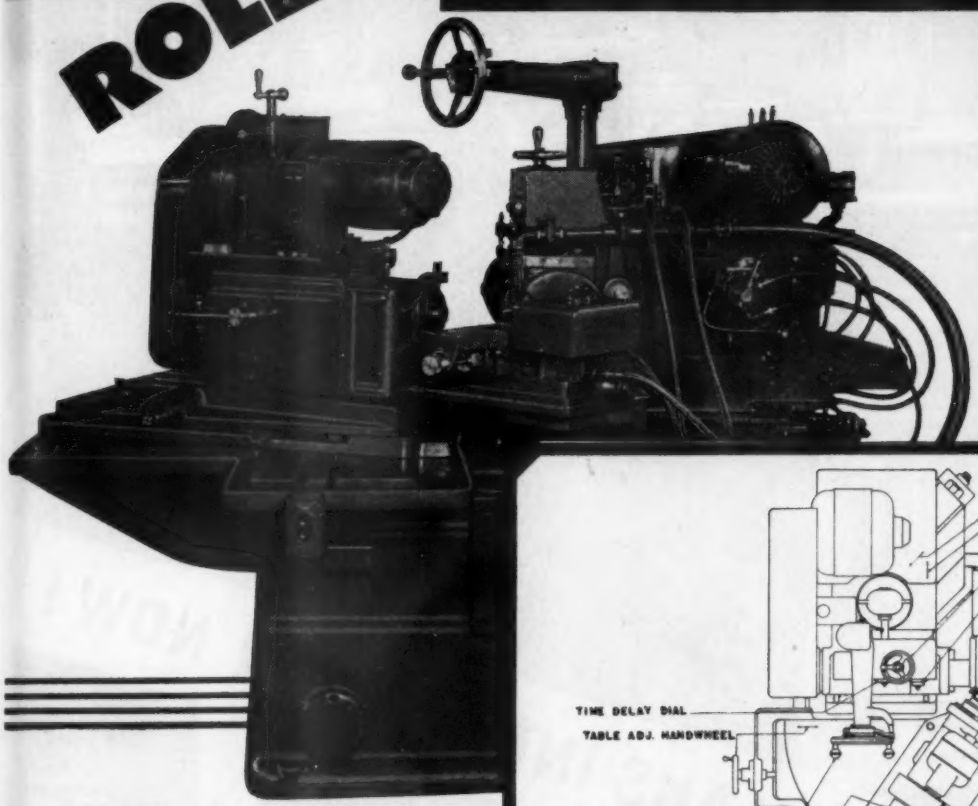
Many machines show 75% greater average daily productivity.

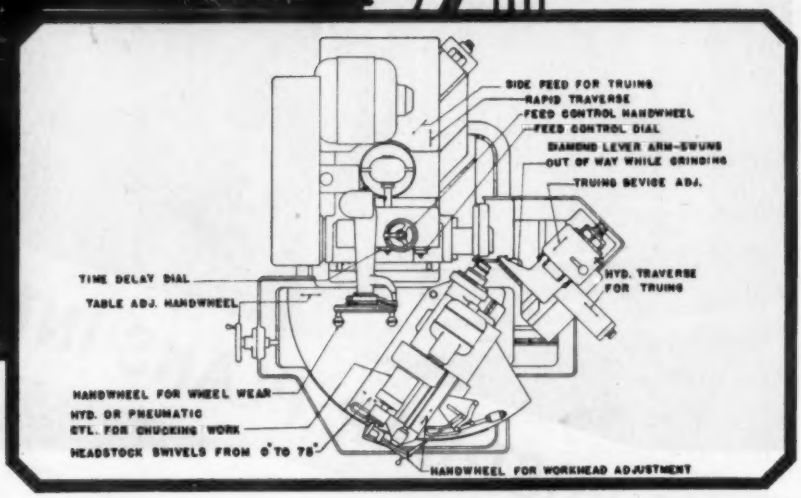
Write for Circular
DEVLIEG MACHINE TOOLS

DE VLIEG MACHINE COMPANY

450 FAIR AVENUE, FERNDALE 20, (DETROIT), MICHIGAN

GRIND ROLLER BEARING RACES ON A FITCHBURG




SIDE FEED FOR TRUING
RAPID TRAVERSE
FEED CONTROL HANDWHEEL
FEED CONTROL DIAL
DIAMOND LEVER ARM—SWUNG OUT OF WAY WHILE GRINDING
TRUING DEVICE ADJ.
TIME DELAY DIAL
TABLE ADJ. HANDWHEEL
HYD. TRAVERSE FOR TRUING
HANDWHEEL FOR WHEEL WEAR
HYD. OR PNEUMATIC CYL. FOR CHUCKING WORK
HEADSTOCK SWIVELS FROM 0° TO 75°
HANDWHEEL FOR WORKHEAD ADJUSTMENT

...and other Chucking Grinding Operations

THE latest Fitchburg Roller Bearing Race Grinder employs a single standard Fitchburg Bowgage Grinding Wheelhead Unit. The workhead is adjustable from o degrees to 75 degrees so that the machine can be used for many other straight or taper grinding jobs.

The Fitchburg Roller Bearing Race Grinder is completely automatic. By pressing a single button the wheelhead goes through its standard automatic cycle — rapid traverse to the work, proper grinding feed, spark-out time, and rapid return. Work is held to limits of .0002" in production.

The workhead can be arranged either hydraulically or pneumatically for collet clamping or other chucking devices.

In this taper grinding application, the wheelhead is mounted on a 45° slide for trueing. The trueing device is mounted on the side of the base parallel to the wheelhead, and is hydraulically operated for trueing, with micrometer adjustment for positioning.

For grinding roller bearing races a Fitchburg grinds them faster and more accurately than other methods. A leading American manufacturer reports enthusiastically on the quality and low production cost of this machine. Write us today for complete information.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.

PUT POST-WAR PLANS INTO ACTION NOW!

War production is still urgent—still our first job. But alert executives are now making plans that will permit a quick change-over to peace-time production. Many are already putting their post-war plans into action by placing orders for machinery to be delivered after the war is won. To help you put your post-war plans into action now, we have developed a practical post-war priority plan on which you can order South Bend Lathes for post-war delivery.

To take advantage of this plan, it is only necessary that you place your order now. No deposit or down payment is required. We ask only that your order be placed in good faith. Each order that is received will be acknowledged by a numbered Post-War Priority Certificate. When civilian production is resumed, lathe orders will be filled as nearly as possible in the order established by the certificate numbers.

Today's prices will apply unless conditions beyond our control necessitate changes. The order may be cancelled at any time. All South Bend Engine Lathes, Toolroom Lathes, and Turret Lathes, embodying improvements developed to meet exacting war production requirements, will be available. No revolutionary changes in design are contemplated.

Investigate this effective plan that will help strengthen your post-war position. Write now for details of our Post-War Priority Plan and copy of Catalog 100-C.

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 37 YEARS • SOUTH BEND 22, INDIANA

Rust . . . is the "cancer" of this spare parts war. *One fingerprint* might turn a tide of battle.

—From a recent article in THE IRON AGE

New TYPE *Aqueous* RUST PREVENTIVE

actually dissolves and neutralizes *fingerprint* residues . . . provides long-lasting protection—

QUAKER FERROCOTE #110

Imagine a *water-emulsion* that not only provides rust protection equal to that of the best solvent-type FERROCOTE . . . but also *dissolves fingerprint residues and neutralizes their corrosive effects* on highly finished surfaces! FERROCOTE #110 is unique in that it has an *unlimited* capacity for doing this, which is not compromised by the influx of alkali cleaners or other contaminants into the slushing solution. Other characteristics of FERROCOTE #110 are:

- Although applied as an aqueous emulsion, it becomes water-insoluble upon drying, but remains readily cleanable in either soap solutions or solvents.
- Is odorless, non-combustible and non-injurious to the skin.
- Readily dispersible in all proportions of tap water.
- Emulsion stability excellent, even in hard water.
- An entirely new organic-type corrosion preventive; contains no paraffin wax.
- Has excellent wetting properties, even on dirty or oily surfaces.
- Dries to provide a thin, colorless, transparent and long-lasting protective film.
- Non-corrosive to lead or copper. (Spec. AN-C-52 Test).

If *your* production of highly finished parts is being sabotaged by the corrosive effect of fingerprints . . . or if the economy and safety of an aqueous type rust preventive appeals to you, investigate FERROCOTE #110. Or, better yet, ask to have a Quaker Process Engineer call and talk over your corrosion problems! His knowledge of rust prevention . . . and the wide range of QUAKER FERROCOTES now available . . . may provide just the solution you seek.

QUAKER CHEMICAL PRODUCTS CORP.

CONSHOHOCKEN, PA.

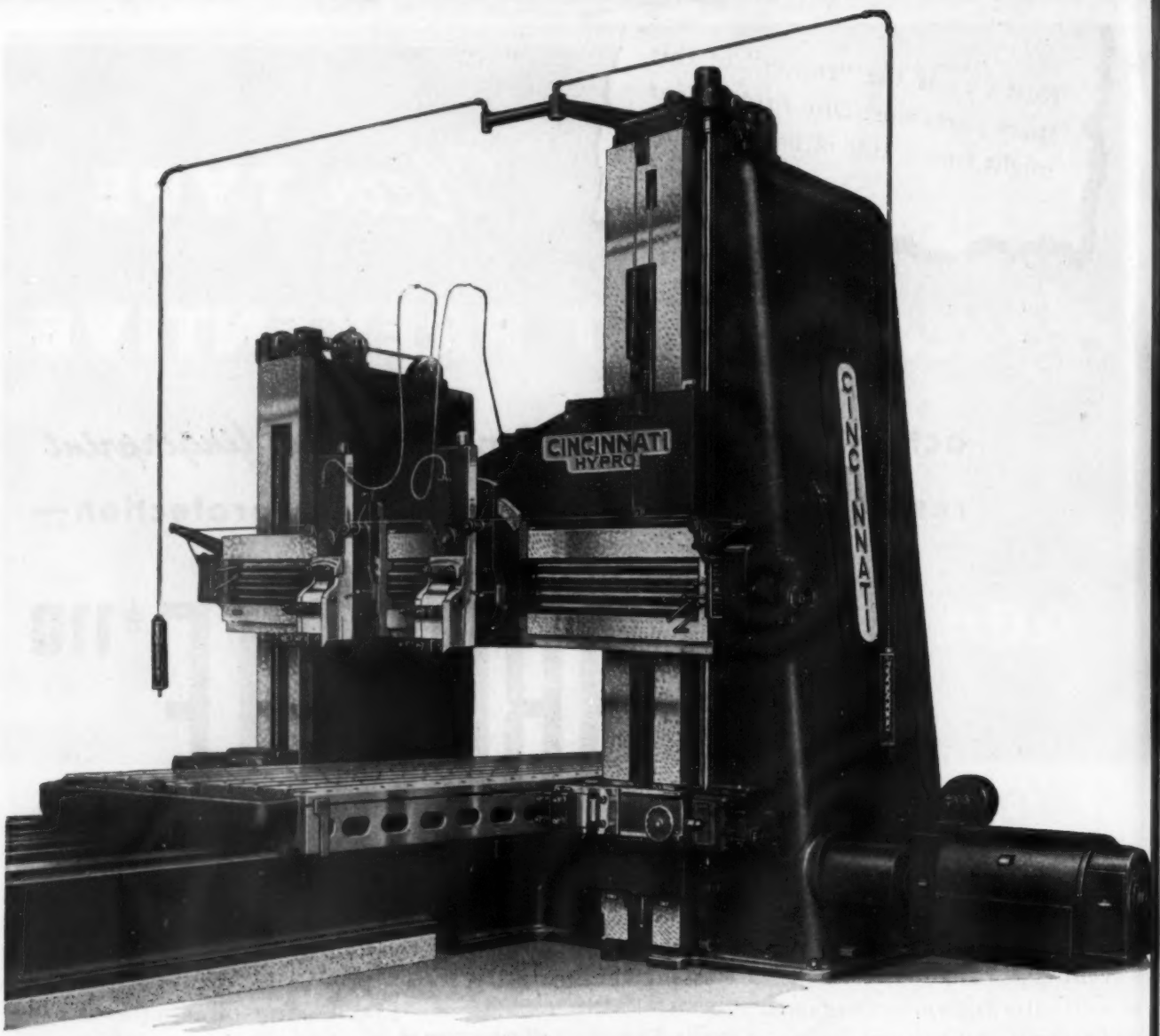
Other Plants in CHICAGO and DETROIT. Warehouse Stocks in Principal Industrial Centers

For more information on FERROCOTE #110 fill in below, tear out and mail.

A Progressive Organization of Research and Process Engineers and Manufacturing Chemists

Name_____ Position_____

•••PLEASE PRINT COMPANY NAME AND ADDRESS IN MARGIN BELOW•••



CINCINNATI HYPRO PLANERS PRODUCE SHIP PARTS FOR INVASION

● Cincinnati Hypro Planers with convertible housings like 132″x96″x40′ Hypro shown above are being used in many American shipyards to machine large metal parts swiftly and economically.

The planer above is equipped with special mechanism for scarfing armor plate.

● The convertible column with side head attached provides for the use of four heads similar to a double housing planer. When the left hand column is removed the openside planer can handle many shapes and sizes not possible on the conventional double housing planer.

Write for Bulletin 110A illustrating Cincinnati Hypro Openside Planers.

ARMY E NAVY

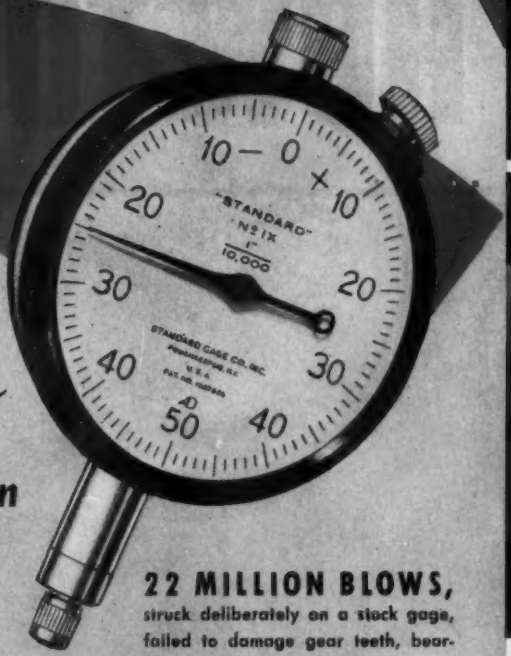
THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

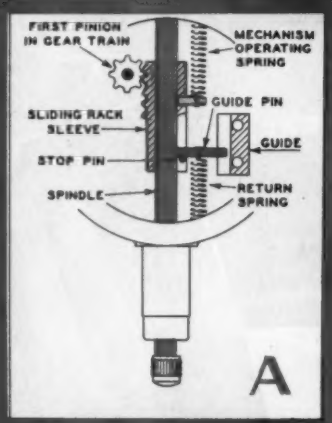
STANDARD

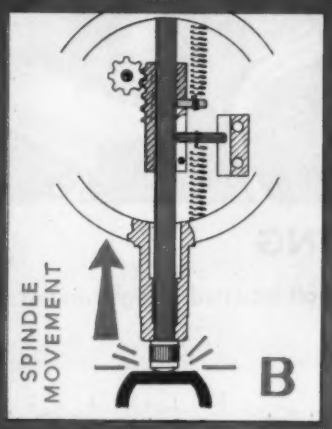
SHOCKPROOF *Dial Indicators*

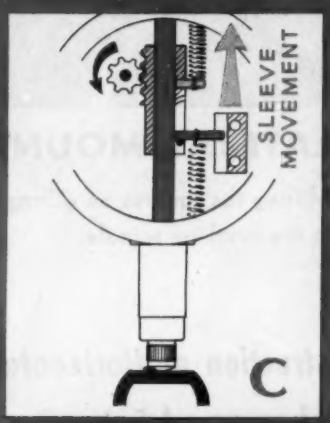


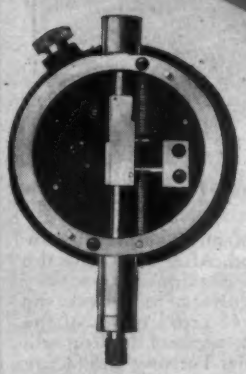
Here's How The SHOCKPROOF Action Protects the Precision Mechanism

22 MILLION BLOWS, struck deliberately on a stock gage, failed to damage gear teeth, bearings or spindle, or impair the instrument's accuracy.









Rear view of SHOCKPROOF Dial Indicator, cover removed, showing "Free Wheeling" mechanism.

A — Rest Position

B — Sudden blow or contact by work piece raises spindle. For an instant guide pin moves away from contact with stop pin. This allows mechanism operating spring to raise the rack sleeve which is slidable on the spindle.

C — Stop pin and guide pin resume contact after the mechanism operating spring has actuated the gearing. Relative position of spindle and rack sleeve is restored.

In actual use only the more sudden shocks against the contact point jar the spindle ahead of the rack sleeve. For normally applied contacts the sleeve and spindle move together as a unit. In any case the force on the mechanism is never any greater than the pull of the spring.

WRITE FOR COMPLETE CATALOG

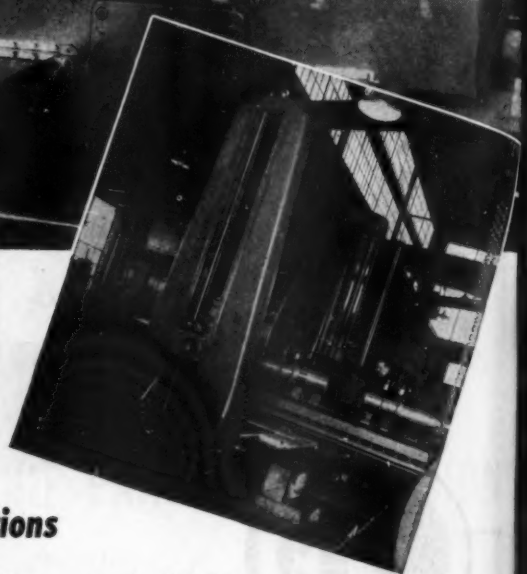
ARMY (E) NAVY

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

HOW TO HANDLE LONG

1 LATERAL MOUNTING

Milling the squares on a long shaft mounted at right angles to the machine spindle.



Open Construction of Horizontal Boring Machine Permits Unhampered Extension of Work in Three Directions

At times you may be confronted with machining unusually long or large workpieces. The open type construction of the horizontal boring machine permits the handling of this type of work. It is possible to set up unwieldy shafts or parts with extensions in any plane—vertical—longitudinal—lateral. Once the workpiece is mounted on the table, actual machining operations are quite simple.

No. 1—Lateral Mounting—Here is an example of how the squares of an exceptionally long shaft were machined. When milling the center square, the shaft balanced on the table. When machining the end squares, the shaft rested with one end on the table, and the other on a roller support, giving the table freedom to travel crosswise for milling.

No. 2—Vertical Mounting—There are no overhead obstructions on a horizontal boring machine to interfere with workpieces. After setting up the connecting rod shown, boring and threading operations were simplified by using a continuous feed facing head.

No. 3—Longitudinal Mounting—Here is an example of how the flanges of a long shaft were machined. After removing the end support, it was only necessary to provide an auxiliary support for the shaft, equipped with rollers, to relieve the table and clamps of excessive strain. Free cross travel of the table, and vertical travel of the headstock permits drilling and reaming of all flange holes without trouble. Turning and facing of the flange, concentric with the shaft, can also be performed in the same setup, with our continuous feed facing head.

It would be impractical to mount and machine such work on any other type of equipment. Probably you have been confronted with similar problems. Experienced G. & L. engineers will be glad to help you solve your machining problems without obligation.

G&L

GIDDINGS & LEWIS

138 DOTY STREET

Right: G. & L. Table Type Machine.

Right: G. & L. Floor Type Machine.

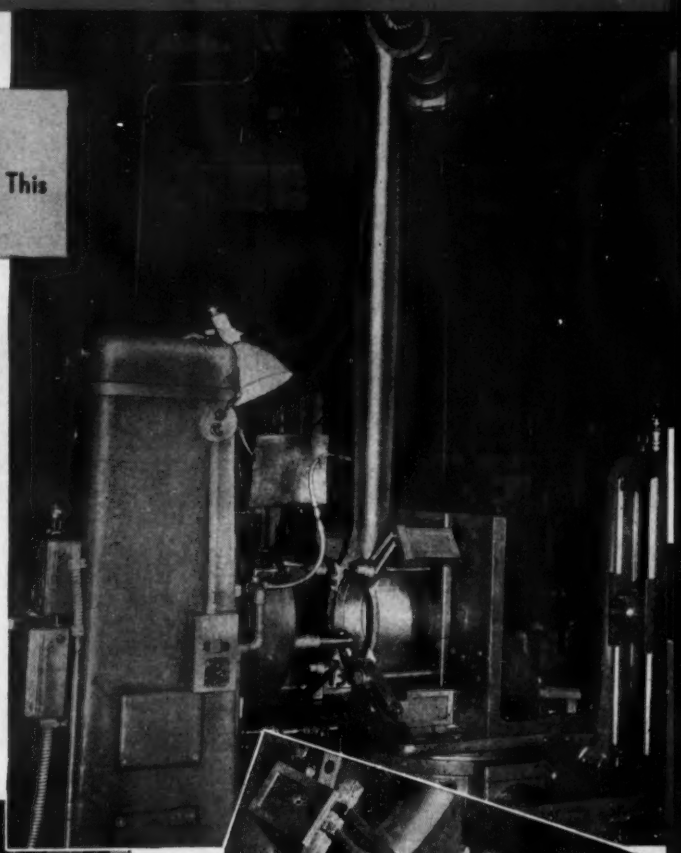
AND UNWIELDY WORK

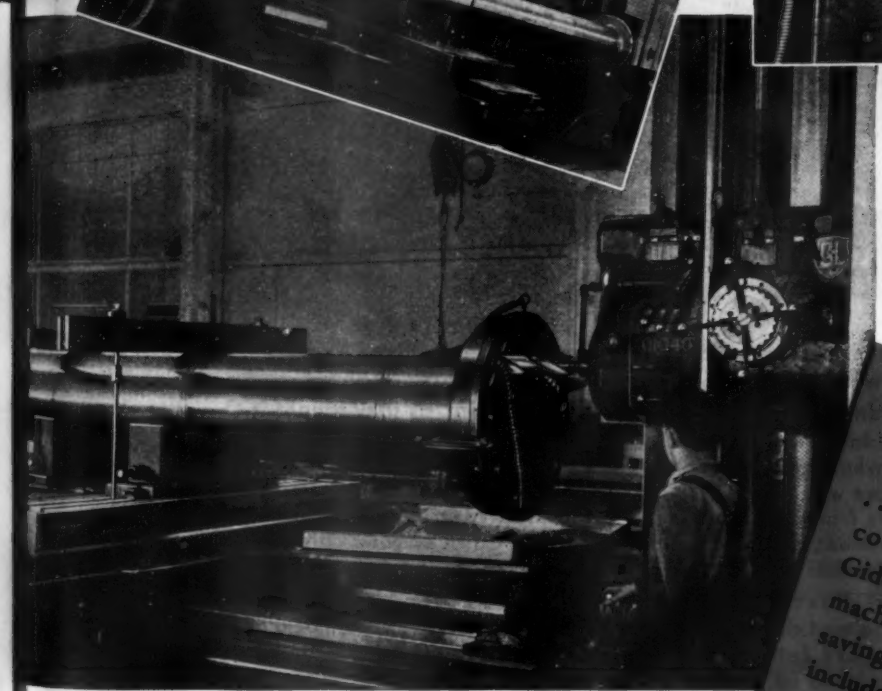
2 VERTICAL MOUNTING

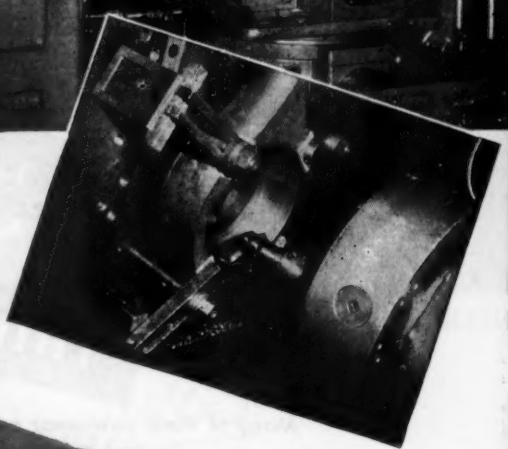
Large connecting rod being bored and threaded. This is a simple setup for unusual work.

3 LONGITUDINAL MOUNTING

Drilling and reaming the flanged end of a large shaft. The end support has been removed to allow the work-piece to overhang both table and bed.

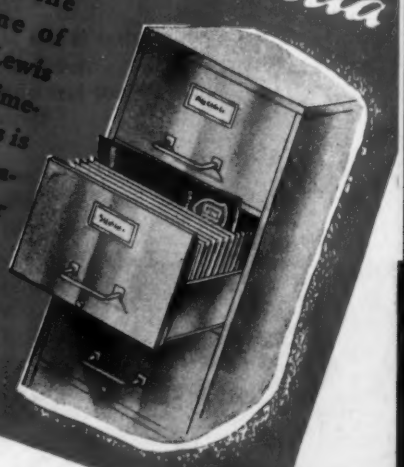






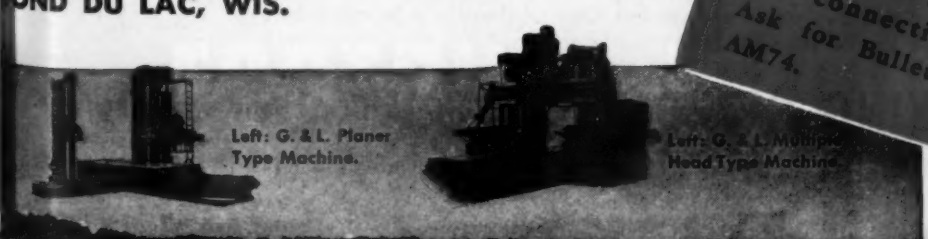
Additional Data

. . . covering the complete line of Giddings and Lewis machines and time-saving accessories is included in this catalog. Write for your copy today — please indicate your business connection. Ask for Bulletin AM74.



MACHINE TOOL CO.

OND DU LAC, WIS.



Left: G. & L. Planer Type Machine.

Left: G. & L. Multiple Head Type Machine.

who dares to talk to them about a THIRD WORLD WAR?

They were at Tarawa.
Many of them now wear empty sleeves, or bandages where their eyes were. And a thousand and twenty-six will rise up never from the sands of Tarawa Island.

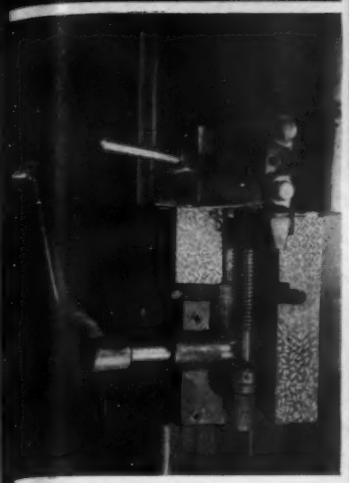
They couldn't hear it. In the roar of that tornado, as they fought and fell, so far from the hills of home, they couldn't hear the words: " . . . *history repeats . . . and what will we get out of it but . . . how the hell can we police . . .. the next one will be against . . . already sowing the seeds for . . . and twenty years from now, brother . . . the Third World War . . .* "
In elevators, on the street, in plush chairs that let you down easy, in columns and editorials and from the political stump.

What is the matter with us? Can't we at home at least go into peace with some spark of their courage and determination that this war is not another mockery, not just another World War? Let no man give voice to that weak and deadly cynicism. Let him stand up and think straight and have the courage to call the lie to any man in public or private life who fails to do the same.

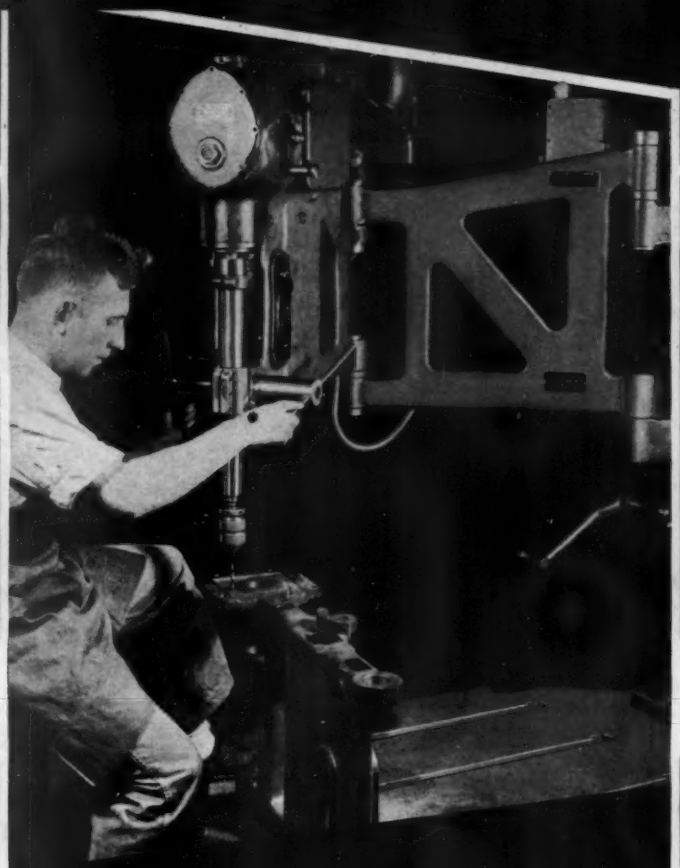
And let each of us do everything humanly possible to help win this war sooner . . . buy War Bonds—give blood—boycott the black market . . . and plan ahead now for a *better* America than we had before.

Today, the engineers of the machine tool industry can greatly help the post-war planners of government and business management. One of these is a Bryant man . . . We invite you to send for him.

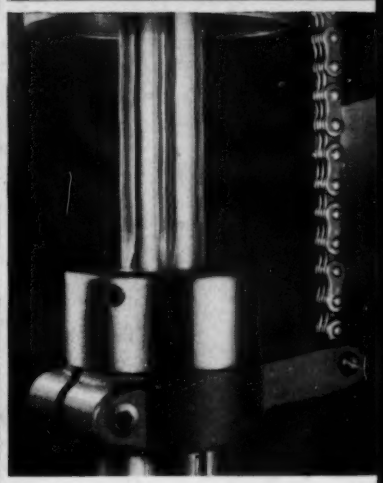
BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD, VERMONT, U. S. A.



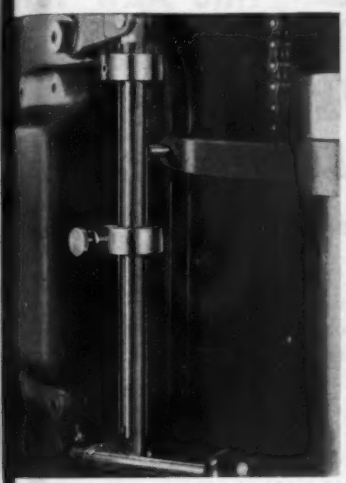
HAND ELEVATION—
POWER ELEVATION OPTIONAL



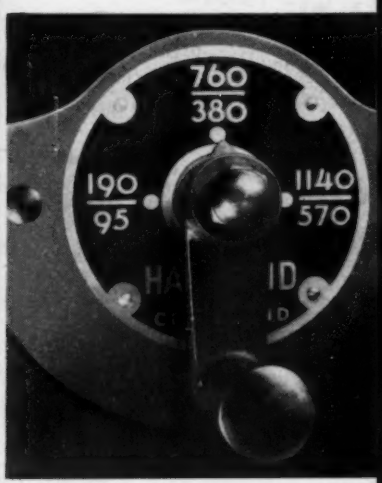
FOR FASTER RADIAL DRILLING AND TAPPING



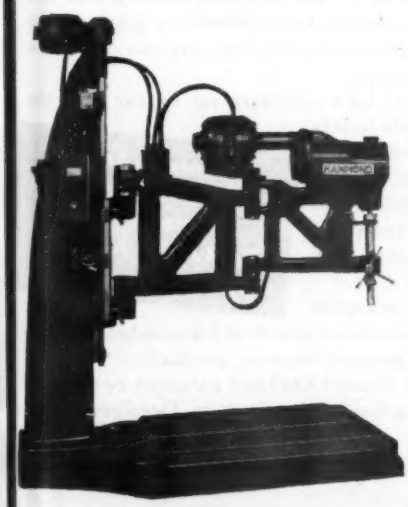
NEW COUNTERWEIGHT
FOR SPINDLE



VENIENT TAPPING CONTROL



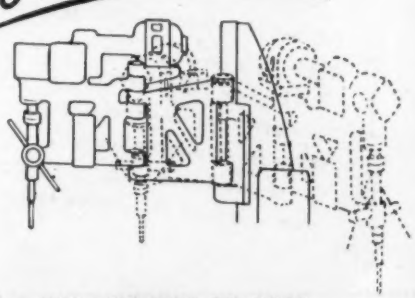
6 SPEEDS INSTANTLY AVAILABLE



• For drilling or tapping miscellaneous holes over a large layout the Hammond Radial is an ideal choice. With its unique bracket type construction the spindle can be swung quickly from hole to hole without any intermediate adjustment. Six quick speed changes are instantly available and the Hammond tapping reverse is very fast and convenient to operate when there are a wide variety of sizes and depths of tapped holes.

THE FOOTE-BURT COMPANY
CLEVELAND 8, OHIO

SWINGS TO ANY POSITION



MOVE UP THE SCHEDULE ☆ WIN THE WAR QUICKER

FOOTBURT-HAMMOND
Radial Drilling Machines

Here's a Complete Index of What You'll Find in this New Deepfreeze Cold Treating "Textbook"

SECTION I—INDUSTRIAL COLD TREATING AND HOW IT IS USED

How Deepfreeze Assisted in the Development of Cold Treating.
How Deepfreeze Sub-Zero Temperatures Can Be Applied to Your Production.
What the New Deepfreeze Process of Cold Treating Is.

SECTION II—DEEPFREEZE SUB-ZERO CHILLING EQUIPMENT

SECTION III—HARDENING OF METALS

What Happens When Metal Is Cold Treated?
At What Temperatures Must Metal Be Cold Treated?
How Long Does It Take to Cold Treat Metal?
Procedure in Calculating the Rate of Production.
Common Cold Treating Procedures.

SECTION IV—STABILIZATION OF METALS

Stabilization of Metals by Cold Treating.
Stabilization Procedures.
Results of Stabilizing Gauges and Precision Machine Parts.

SECTION V—SHRINKING OF METALS

Shrinking of Metals by Cold Treating.
Advantages of Chilling for Shrink-Fit Assembly.
Procedure in Shrinking Metal.
Results of Shrink-Fit Assembly by Cold Treating.

SECTION VI—TESTING AND MISCELLANEOUS APPLICATIONS

Testing of Aircraft Instruments and Materials at Sub-Zero Temperatures.
Miscellaneous Applications.

SECTION VII—TECHNICAL DATA AND TABLES

Table for Conversion from Degrees Centigrade to Degrees Fahrenheit.
Shrink-Fit Tolerance Table.
Shrink-Fit Allowance Table.
List of Deepfreeze Users.
How to Use the Deepfreeze Technical Service.

THIS NEW 1944

Deepfreeze

COLD TREATING "TEXTBOOK"

● To bring you up-to-date on cold treating, Deepfreeze has just released a new "Cold Treating Practice" manual containing the latest authentic information on the use of sub-zero temperatures for the hardening, stabilization, shrinking, and testing of metals and other materials. This 40-page "textbook" contains the latest developments and practices finding widespread use today in the cold treatment of metals.

This Free Book Will Show You How to Get the Advantages of Cold Treating in Your Plant

Whether or not you are using sub-zero temperatures in your plant at present, you will be interested in the new procedures that have been developed. If you are now cold treating, you will be able to check your applications against those listed—and many of these have been discovered only recently—to determine whether you are using it to full advantage.

Cold treating is on the move. Yesterday's literature no longer tells the complete story. The rapid progress made in this field since the publication of the first Deepfreeze Cold Treating Manual late in 1943 is of extreme importance to industrial users. To bring you the latest information, Deepfreeze presents this new working guide on the use of sub-zero temperatures.

Contains Latest Authentic Data from Metallurgists, Production Men and Deepfreeze Users

This book reflects our pioneering experiences in the science of cold treating and the sound practical knowledge we have accumulated from metallurgists, heat treating experts, production men and Deepfreeze users. The material for this manual has been gathered by our staff of field engineers constantly reporting the applications of Deepfreeze sub-zero temperatures in industry.

Send coupon today for your free copies

Every executive and production man concerned with the "conditioning" of metals should have a copy of this new book. Send the coupon today for the number of copies you need for your key men.

epfreeze
27 Davis Street, North Chicago, Illinois

Please send.....copies of the new 1944 Deepeze "Cold Treating Practice" book to

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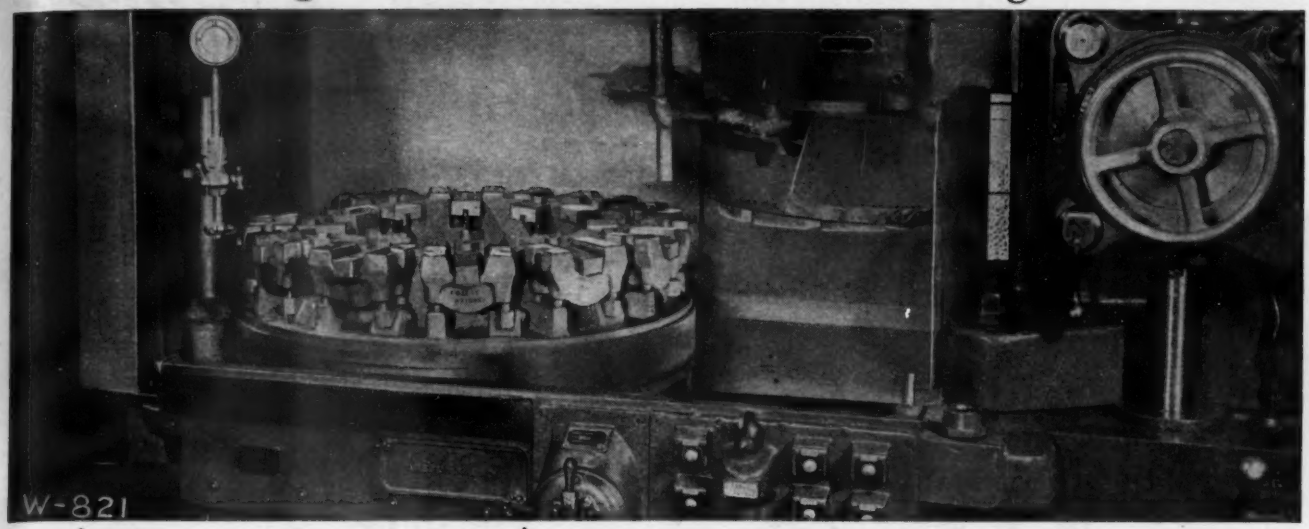
"Only Motor Products Can Make a DEEPFREEZE"

Deepfreeze

2327 DAVIS STREET
NORTH CHICAGO, ILLINOIS

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

★Production ★Adaptability Close Limits ★Operation Saving
Material Saving Fine Finish Fixture Saving ★Flatness



★*Production* ★*Adaptability* ★*Operation Saving* ★*Flatness*

Grinding Bearing Cap Joints

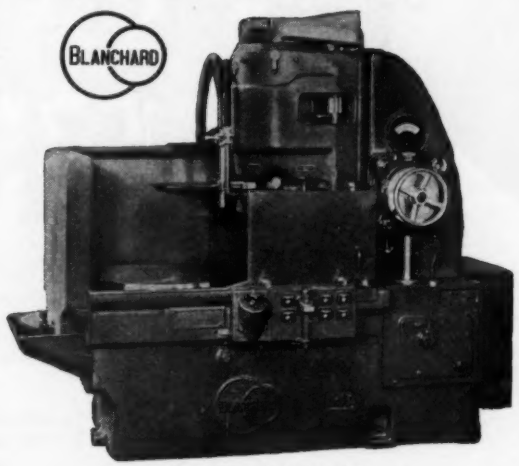
These nickel steel forgings are bearing caps for the master rods of radial engines.

The No. 18 Blanchard Surface Grinder removes from .060″ to .090″ of metal from twelve of these caps in one operation requiring 27 minutes.

This is only one of the many airplane engine parts that are being ground on the Blanchard, using magnetic, hand clamping or automatic fixtures.

"Put it on the Blanchard"

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



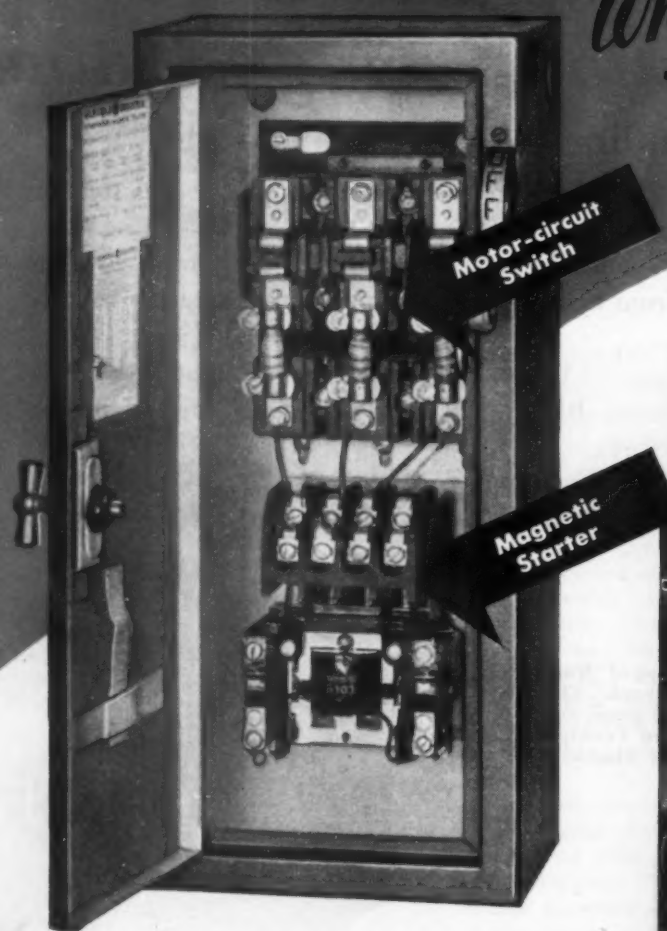
No. 18 Blanchard Surface Grinder

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

You can save time and space -

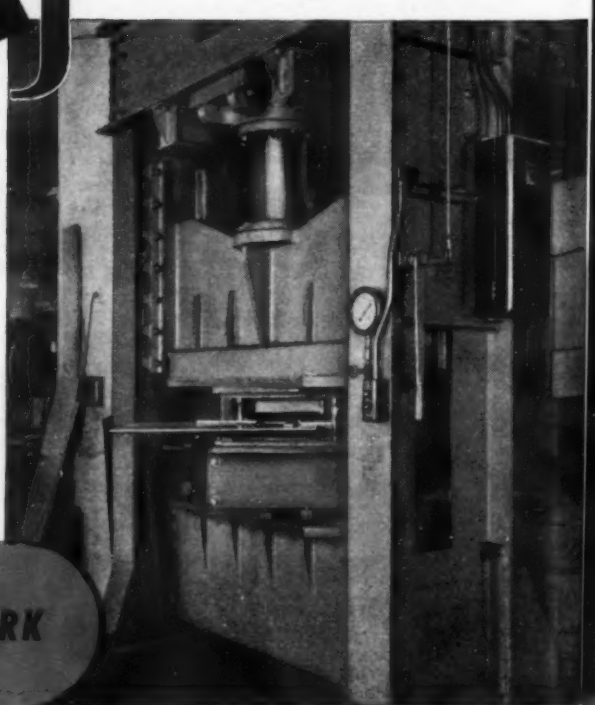
ONE COMPACT

Why two devices? ONE



COMBINATION STARTER

Combination starter and push-button station on a press



G-E COMBINATION STARTERS AT WORK

- gain greater protection too

UNIT

can do the job.

FOR MOTOR CONTROL AND PROTECTION

YOU no longer need buy a separate device for each function of motor control. Now you can get *combination* control—in a *variety of enclosures* to meet every operating condition. This control combines a motor-circuit switch and a magnetic starter in one, compact, easy-to-mount unit.

By using these starters you profit five ways:

1. Quick Selection—By ordering *one* factory co-ordinated unit instead of two, you can save time. You just specify the motor rating and indicate the type of motor-circuit switch you want and the type of application you have in mind—we'll send you the starter you need.

2. Reduced Installation Time—Users of combination starters report a 50 per-cent reduction in mounting time and a 40 per-cent reduction in wiring time.

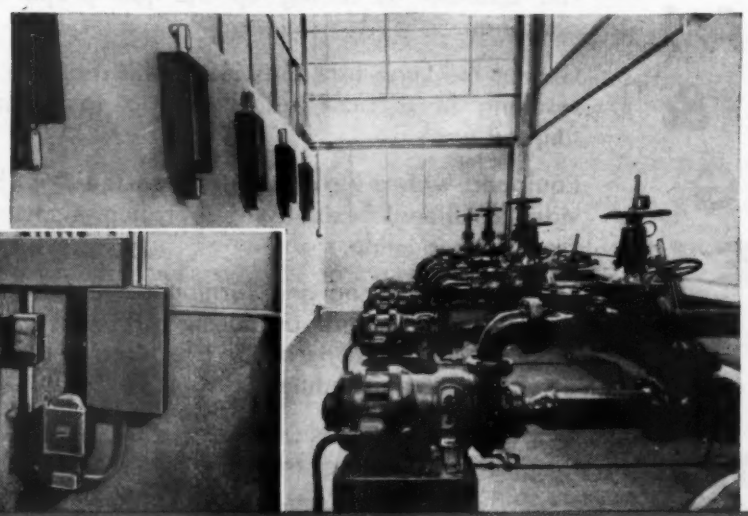
3. Motor Protection—With G-E combination starters, you're sure that the rating of the motor-circuit switch or breaker matches that of the magnetic starter with which it is to be used. The co-ordination of thermal overload relays with the fuses or breakers affords complete motor overcurrent protection under any condition of operation.

4. Greater Safety—The motor-circuit switch, being in the same case with the magnetic starter, is mechanically interlocked with the cover. Thus the cover cannot be opened while there is power on the starter.

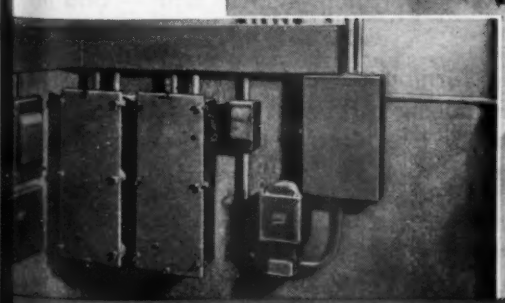
5. Less Space Required—Combination starters take less mounting space than separately mounted safety switches and starters.

These starters are also available for high-voltage starting. For further information on combination starters write to your local office for Bulletin GEA-3715. *General Electric Company, Schenectady 5, New York.*

Combination starters (on wall at left) installed in a pump room

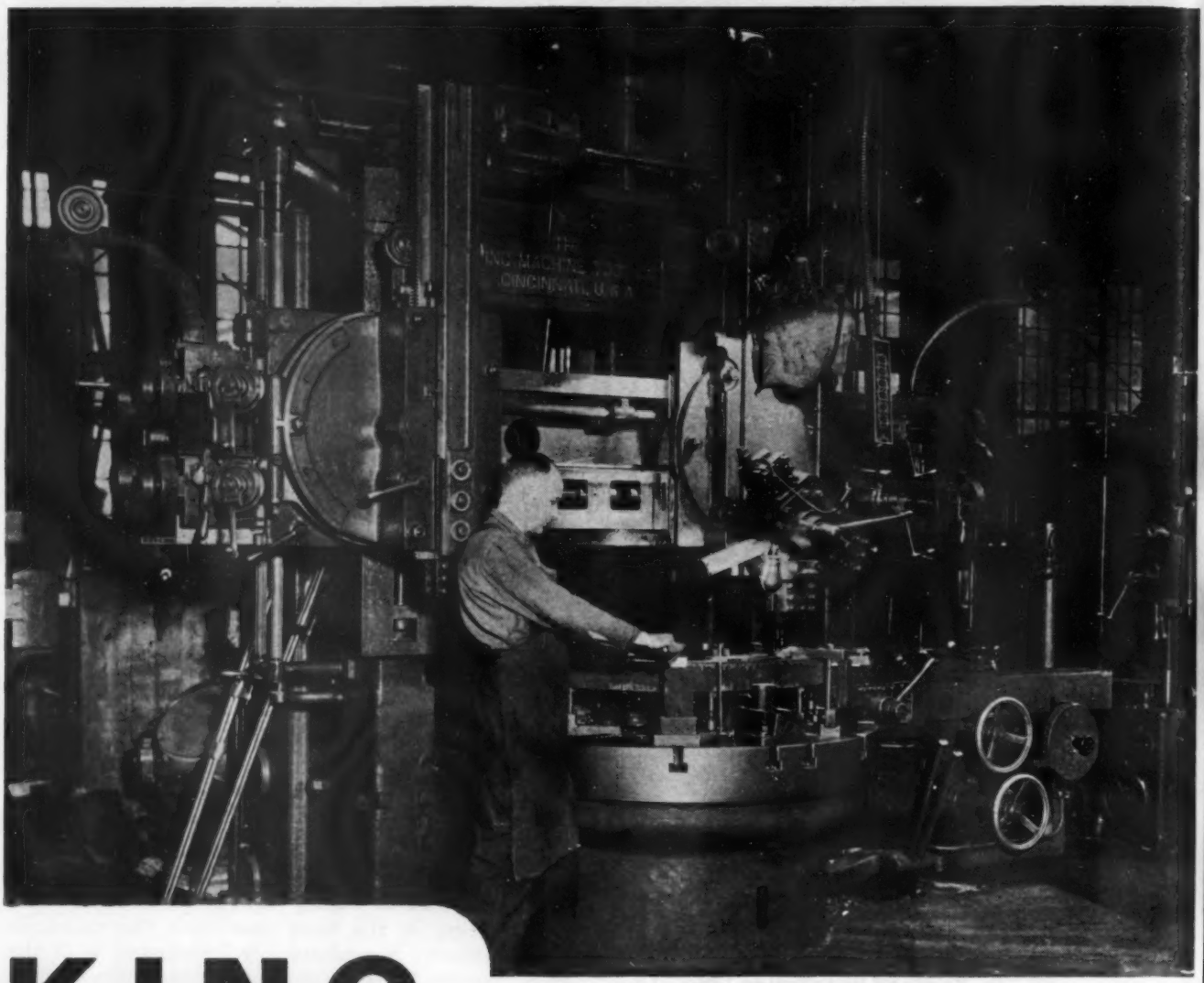


For reliability of operation, combination starters with dust-tight enclosures in a grain elevator



Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds

GENERAL ELECTRIC



KING VERTICAL BORING & TURNING MACHINE

Facing Turbine Parts

● This 62 inch King Vertical Boring and Turning Machine is facing spacers on the diaphram half of a cast steel turbine. The operator is setting up the job preparatory to facing operation.

One of the important features of this machine is its rigidity — resulting in a close adherence to tolerances and smooth finished work.

Equipped with a hexagon turret on the right hand head provides additional flexibility of operation — saves time — and increases production.

King Vertical Boring and Turning Machines have gained wide acceptance in plants producing vital war work due to their ability to maintain accuracy over long periods — working on 24 hour a day schedules.

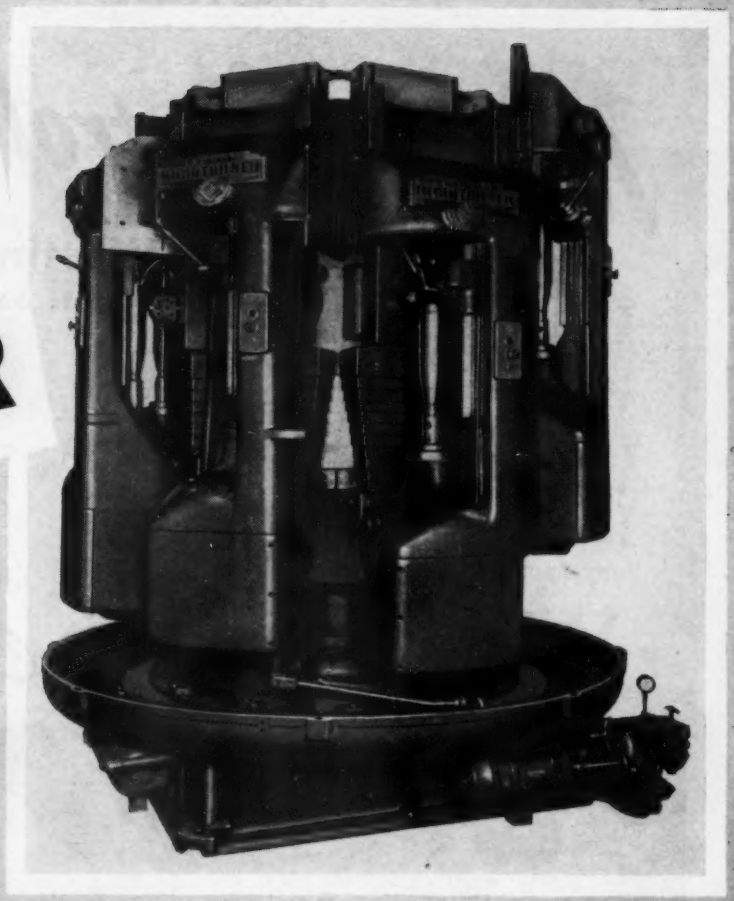
King Builds — Vertical Boring and Turning Machines exclusively —single column types from 30" to 42" — double column types up to 12 feet.

THE KING MACHINE TOOL COMPANY
CINCINNATI 32, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

For Low Cost Mass Production

THE RIGIDTURNER



● Today high production to specific tolerances is the one thing required to meet urgent war needs. The Rotary Model Rigidturner is designed for the mass production of duplicate work requiring the turning of several diameters.

On the Rotary Rigidturner eight spindles operate at one time, continuously—assuring the greatest possible production. Faithful duplication and continued accuracy is made possible by the use of special form cutters.

The operation of the machine is automatic and very simple. Operator merely loads and unloads work at loading station—the machine "carries on" from there.

The Rotary Rigidturner is making record production in many shops turning shell up to 105 MM. This method applied to post-war operation will not only produce accurate work in quantity but do it at costs favorable to competing markets.

This Booklet describes the Rigidturner in detail—explains fully the process of multiple diameter turning—and shows its many advantages in the production of uniformly accurate work at exceedingly low costs. Write for a copy today.

The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

WHEN YOU NEED

Motor Control Accessories

consult Westinghouse Buying Data

(NEW CATALOG 7000)

With the new Westinghouse Buying Data, you can select and purchase the proper motor control in half the time.

Data, as presented, is striking in its newness. It's easier to read, easier to understand, and easier to use than any published previously by any manufacturer.

Chances are—if you are a buyer of motors and controls—that you have already received a copy of this new Catalog 7000 by mail. However, if you have not received your copy, write, wire or phone your nearest Westinghouse district office. (Requests will be filled through district offices only — no mailing from Westinghouse headquarters at East Pittsburgh.) J-60551

Westinghouse PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE *Control Accessories*

Direct-Acting Limit Switch, Single or Double-Acting Roller Lever Type, for A-C and D-C Motors.
D-C Field Rheostat, Handwheel or Sprocket-Operated, for Motors and Generators.
Special Service, Foot-Operated Push Button for Magnetic Starters and Controllers.
A-C or D-C Heavy-Duty Push Button, Air Break Station for Class I, Group D and Class II, Groups E, F, G, Hazardous Locations
A-C or D-C Heavy-Duty Push Button, Surface-Mounted Station with Indicating Lamp.
A-C or D-C Heavy-Duty Push Button, Water and Dust-Tight Station; Suitable for Outdoor Service.
A-C or D-C Heavy-Duty Push Button, Oil-Immersed for Class I, Group D and Class II, Groups E, F, G, Hazardous Locations.
Pressure and Vacuum Switch for Water Pumps, Air Compressors and General Duty.
Chain-Operated Float Switch for A-C or D-C Pilot Circuits.
A-C or D-C Standard Start-Stop Push Button.
Reversing and Nonreversing General-Purpose Master Switch for A-C or D-C Magnetic Controller.
Rod-Operated Float Switch for A-C or D-C Pilot Circuits.
A-C or D-C Standard Push Button, Dust and Water-Tight Station.

B

DEPENDABLE *REPEAT* ACCURACY ON NOS 20 AND 22 SPEEDS PRODUCTION

Operators and owners profit alike from the consistency of precision at Fast Rates of Production obtained with these plain grinding machines through

— STURDY CONSTRUCTION

— UNIQUE FEATURES of ELECTRICAL CONTROL

promoting greater operating ease and repeat accuracy

Investigate the advantages of these Electrically Controlled Plain Grinding Machines on your work

Nos. 20 AND 22

10"x18" 10"x36"

PROMPT DELIVERIES

BROWN & SHARPE MFG. CO.
PROVIDENCE 1, R. I., U. S. A.

BROWN & SHARPE

GET FINER AND FASTER A. C WELDING WITH AMPAC "400"

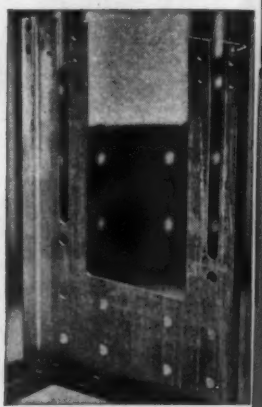
1 Revolutionary new patented circuit *increases* efficiency — *cuts* idling loss! Entire construction is *simple, rugged!*

2 Transformer coil uses *rectangular* copper — glass-insulated — with primary over secondary. Air duct between windings dissipates heat — *prevents* breakdown!

3 Sturdy lower core is 1-piece, U-shaped . . . of die-punched silicon steel. Insures quiet operation . . . with *no* power-wasting air gaps!

6 Power regulation is *smooth — quick — simple!* One-inch movement of upper core covers entire welding range — 50 to 500 amps — in *seven turns* of control wheel. Cuts adjustment time to *minimum*. Speeds welding! A 1677

4 Here's typical Ampac quality — a big, tough, *extra heavy* welding terminal. Note *brazed* connections!



5 Hardened brass guide is simple, fool-proof! Channel shape provides *extra* strength.

GET COMPLETE FACTS on this brilliantly engineered a.c. welder from your nearby Ampac dealer or Allis-Chalmers district office. Ask for bulletin B6302. For data on new Ampac "200" welder, ask for bulletin B6241.

ALLIS-CHALMERS

MILWAUKEE, WISCONSIN

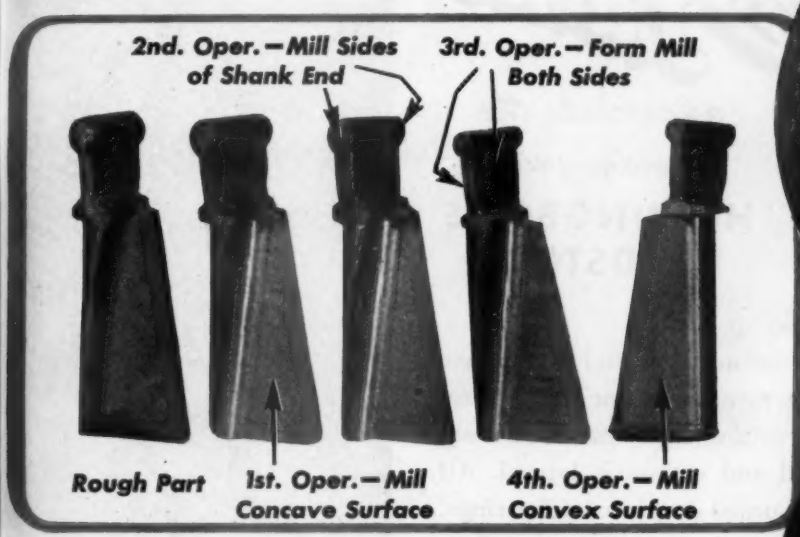
ANOTHER EXAMPLE OF

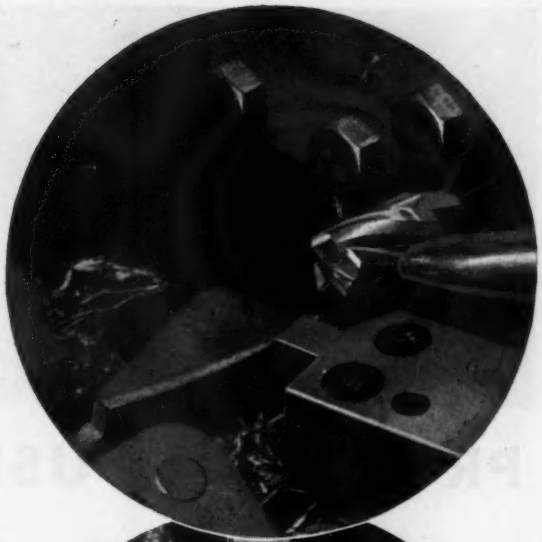
BARBER-COLMAN

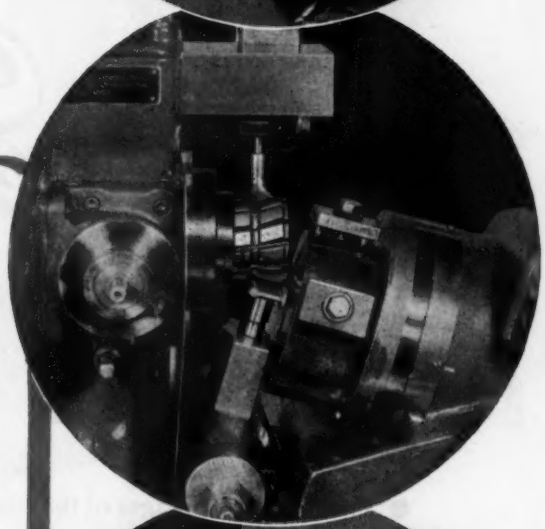
CUTTER ENGINEERING

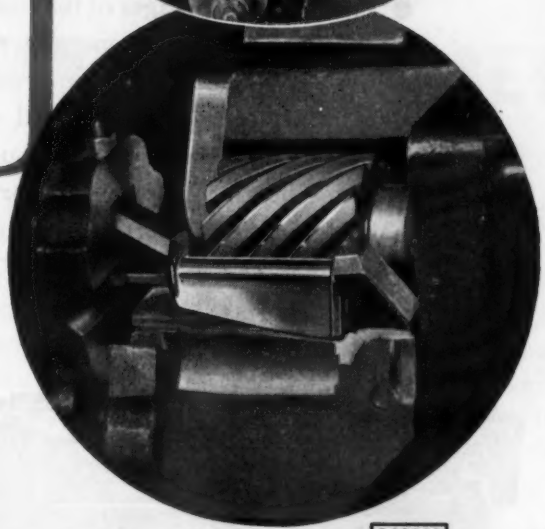
The customer's problem was one of machining replacement parts on foreign built equipment for which previous production experience was not available. Accuracy and extra fine finish were required, at a good production rate. B-C engineers were furnished with finished sample parts only, and, using these, designed special cutters which could be mounted with great rigidity to give the fine finish desired.

This engineering experience, gained as a result of 35 years of dealing with milling problems, can help you solve similar cutter problems, without extra cost. Why not call your Barber-Colman representative today and let him work with you.


2nd. Oper.—Mill Sides of Shank End
3rd. Oper.—Form Mill Both Sides
Rough Part
1st. Oper.—Mill Concave Surface
4th. Oper.—Mill Convex Surface







CLOSE TOLERANCES *on* FORMING CUTS *obtained with* B-C UNGROUND *Milling Cutters*

In this instance, the piece is a blade for a turbo charger, to be machined with extra fine finish from a stainless steel forging. Tolerances of ±.0003" are held on size and form. Net weight of all blades in complete assembly of rotor is required within 1 oz. of standard. The form cutters are UNGROUND, and the profile mills are designed with special helix and clearances to give long life and meet the accuracy and finish requirements. Results were extremely satisfactory. *For greatest tool efficiency — use BARBER-COLMAN Cutters.*

Operations in milling stainless steel turbine blade. Top, milling the concave inside surface. Center, forming the holding end. Bottom profiling the convex outside surface.

Buy War Bonds

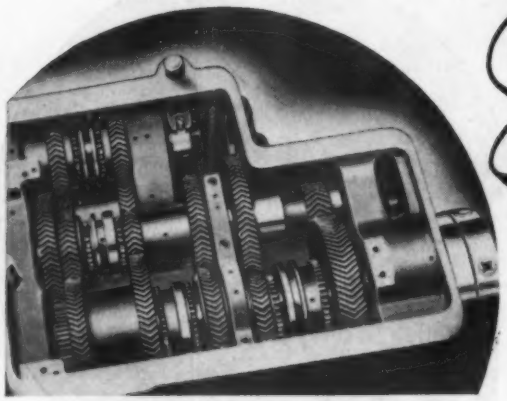
BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

PROMINENT USERS OF

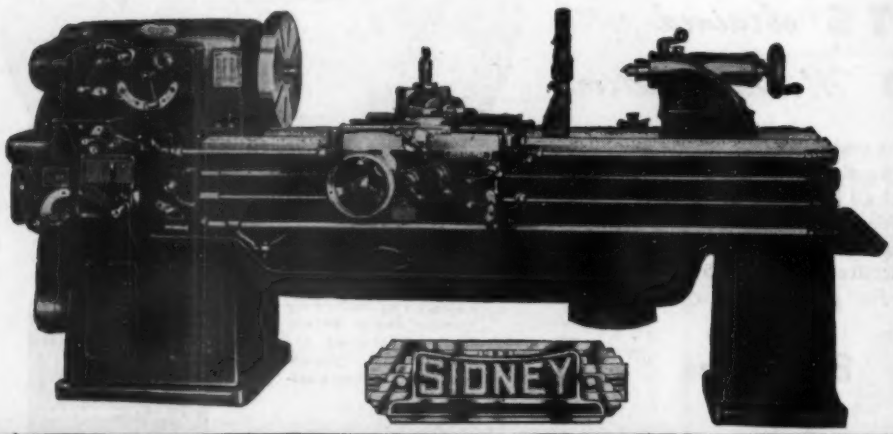


Sidney Lathes

appreciate the sturdy, quiet

HERRINGBONE HEADSTOCK

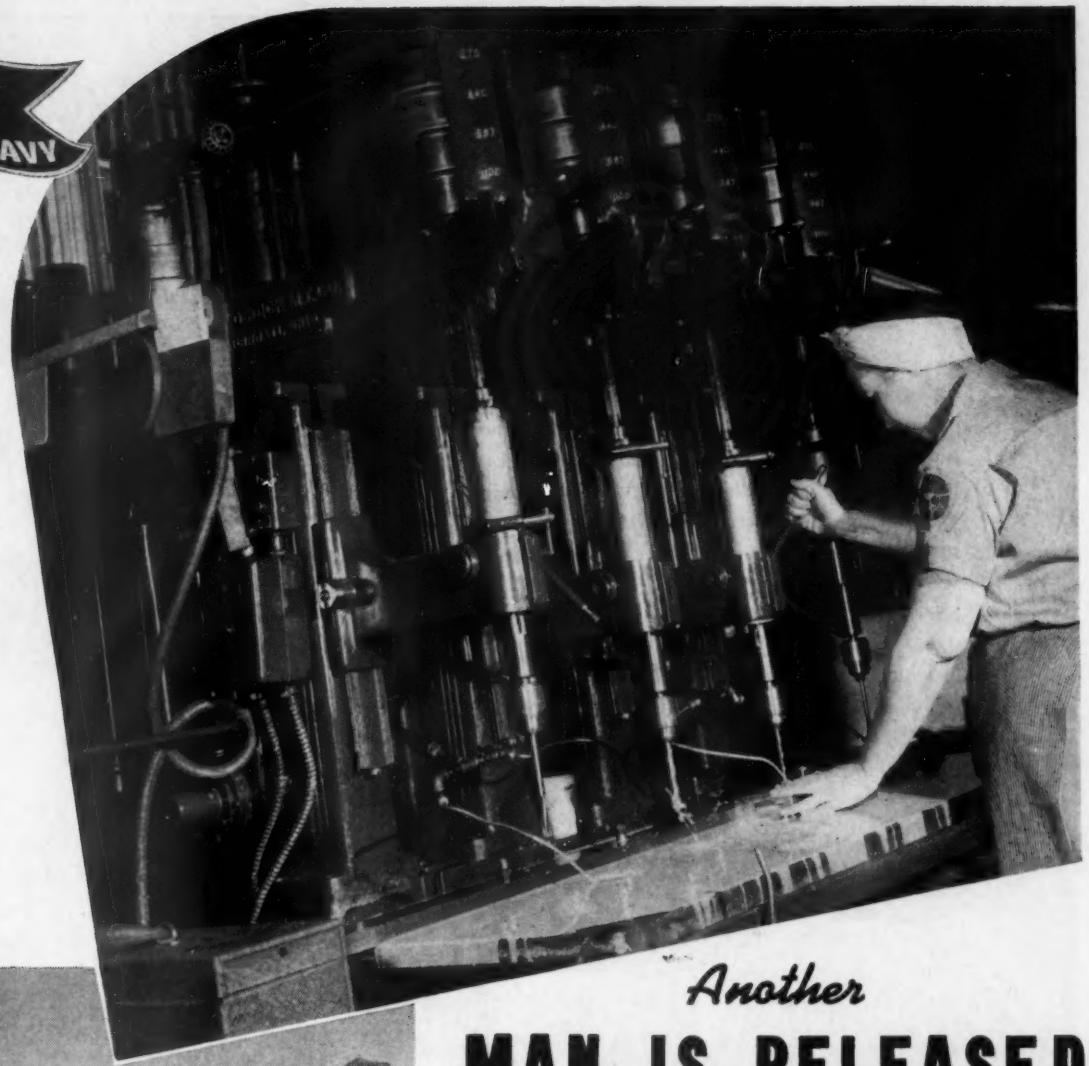
● The many advantages of the continuous tooth Herringbone geared headstock are generally recognized for the greater strength and smoother action resulting from increased tooth contact. All gears are generated and cross-axis lapped. All shafts including main spindle mounted on precision bearings. A center bearing is provided for spindle and intermediate shaft eliminating deflection and insuring continued accuracy.

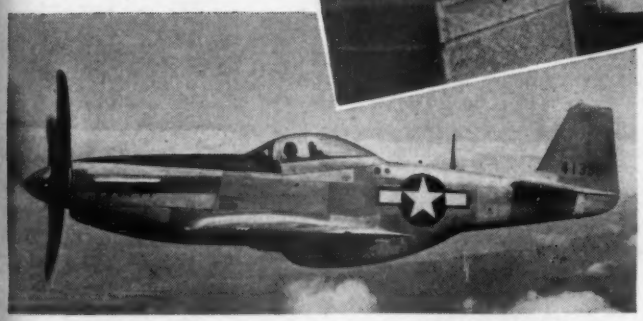


The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO





Another

MAN IS RELEASED

for active duty!

WOMEN FIND FOSDICK SENSITIVE DRILLS EASY TO HANDLE

● Every time a woman takes over a man's job she is not only being patriotic by releasing a man for active duty but is helping to meet vital plane production so urgently needed at our various battle fronts.

The simplicity of design and construction — the centralization of controls — and the ease of handling enable women operators to become adept at operating the machine in a short time. Rigidity of construction assures dependable accuracy.

Illustrated is a Four Spindle Fosdick Sensitive Drill at the plant of North American Aviation, Inc. The operator drills on first spindle, reams and drills on second spindle, drills on third spindle, performs two reaming operations and drills on fourth spindle. The piece is the base assembly of the trim tab position indicator for a P-51 Mustang.

Progressive operations, such as illustrated, are handled quickly, easily, at low cost on Fosdick Multiple Spindle Sensitive Drills. Full details of construction and operation are contained in the Fosdick High Speed Drill Bulletin H.S.A. *Write for a copy today.*

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

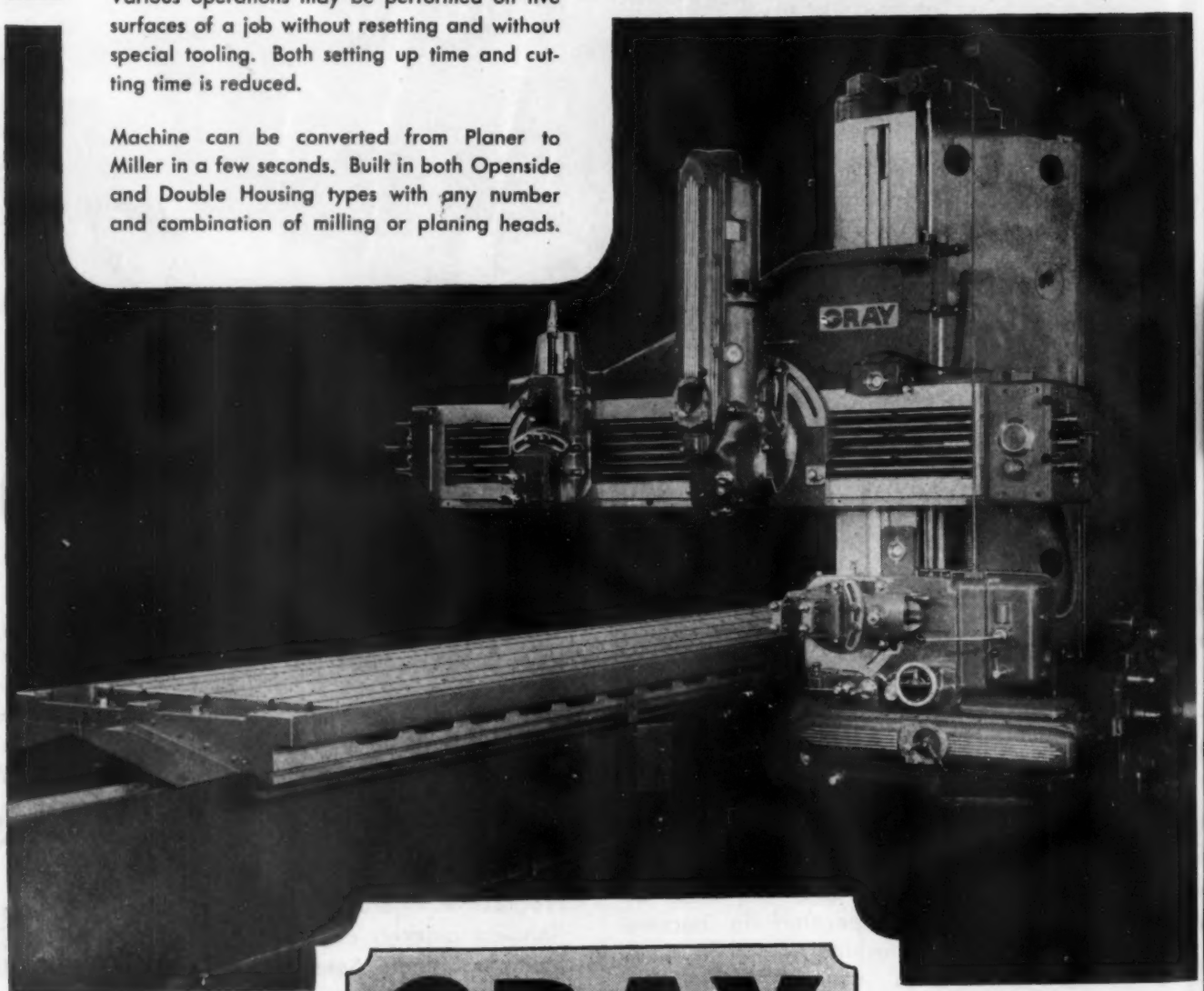
GRAY

48" OPENSIDE MILLING PLANER

Equipped with one planer head, one swiveling milling head on cross rail, and combination planer and quill type milling side head enables this machine to handle a wide variety of work. Various operations may be performed on five surfaces of a job without resetting and without special tooling. Both setting up time and cutting time is reduced.

Machine can be converted from Planer to Miller in a few seconds. Built in both Openside and Double Housing types with any number and combination of milling or planing heads.

It PLANES *and* MILLS It BORES *and* DRILLS



GRAY

THE G. A. GRAY COMPANY
Cincinnati 7 Ohio, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

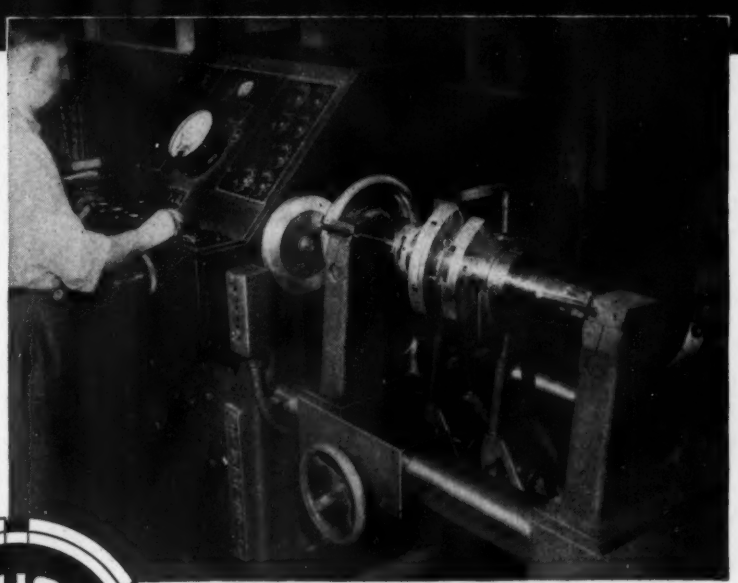
SHOW UP!

THE police show ups provide a quick and effective means of putting public enemies on the spot.

Just as quickly, the enemy of high-speed machinery —*vibration*—is recognized and prevented from preying upon assemblies with vital rotating parts.

With the keen perception of the electronic tube and the stroboscopic lamp, Dynetric Balancing Machines* *locate* and *measure* unbalanced forces so quickly and unfallibly that accurate static and dynamic balance has become a matter of low cost routine for quality products.

** development of Westinghouse Research Laboratories.*



GISHOLT MACHINE COMPANY
1201 E. Washington Ave. • Madison 3, Wis.

Look Ahead... Keep Ahead...
With Gisholt Improvements

GISHOLT

DYNETRIC BALANCING is serving vital war industries by assuring smoother performance and longer life in such parts as radial and in-line crankshafts, armatures for electric motors and generators, super-charger impellers, and dozens of other high-speed rotating parts. The Dynetrics can also help you make a better product in the postwar period. Write for literature.

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

Then he said to himself

"THEY CAN NEVER BOMB THIS PLACE"

WITH 300 pound vehemence, Reich-Marshal Hermann Goering once impressed the heilers and the heiled in Berlin with this guarantee:

"THEY CAN NEVER BOMB THIS PLACE"

He was not trying to mislead.

Give him credit . . . he had figured it out as any business man would:

(a) He figured what his competition had

(b) He figured what he had

The answer was simple arithmetic . . . then, departing from arithmetic

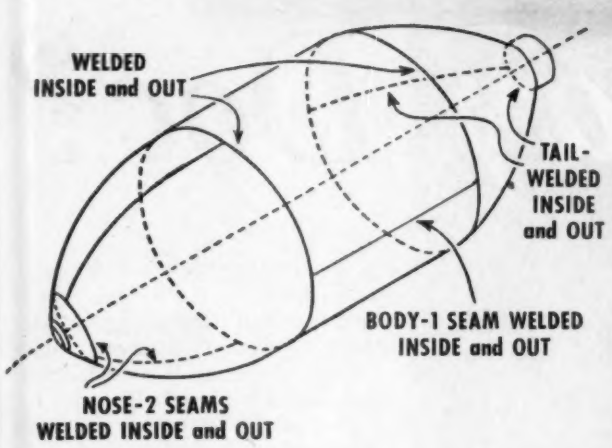
(c) He *estimated* how long it would take his competition to catch up. On *that* he went completely crackpot—unalterably haywire—irretrievably "losing his market" as they say.

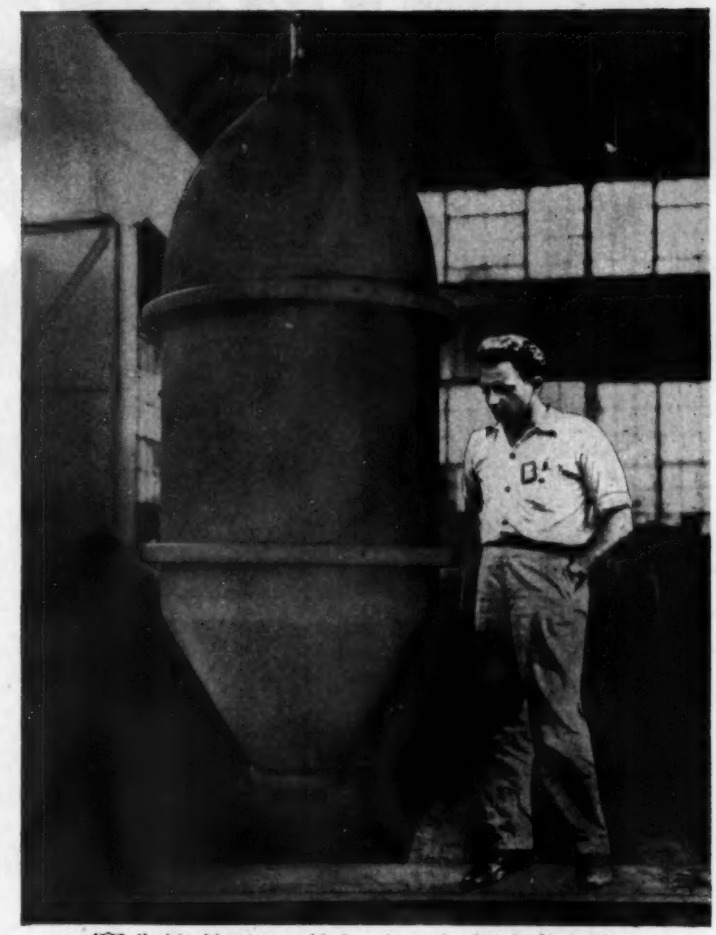
And that just proves again that NO ONE can estimate the regular step-ups in output made possible by enthused producers

. . . having recourse to a flexible production technique

. . . that keeps improving regularly.

Listen Hermann, Never say NEVER!





4000-lb. blockbuster, welded as shown in sketch. Its production has been increased by improved arc welding technique.

You're too cagey a rascal *not* to have figured that *recourse* to Arc Welding would speed America's war output. So you estimated that step up at, say, 25%.

But as it turned out, production of Berlin-busters, ships, planes, tanks and guns was stepped up another 25% and then other 25%'s by added recourses applied AFTER your "NO BOMBING" assurance.

And now, the knockout blow

. . . Lincoln introduces the New "*Fleet-Welding*" Technique

recourse to which gives additional step-ups in welding production of 25% . . . 50% . . . 100% . . . and more.

This arc welding technique, developed by Lincoln Engineers, uses *arc force* to get deeper penetration and higher welding speed for all types of joints in mild steel plate, shapes and sheet. Procedure manual with full details will be sent free to engineers and production supervisors.

There is a Lincoln Engineer near-by to assist you in applying the "Fleet-welding" Technique to war production and postwar planning. Call him or write:

THE LINCOLN ELECTRIC COMPANY • Cleveland 1, Ohio

America's greatest natural **recourse**

ARC WELDING

What do You Say, Doc?

THE "DOCTOR"— McGarvey Eddleman of Allis-Chalmers Norwood Works—is taking a temperature reading during the heat-run test. It's just one precaution that helps Allis-Chalmers build consistently great motors.

NO—THAT'S NOT a sick motor. Actually it's a very *healthy* one. But that's something we must know — through generous sample testing — before Allis-Chalmers motors can tackle jobs for you.

Part of the "physical exam" that motor at the left must pass is the heat run test. Bristling with thermometers, the motor runs at full load — and speed and temperature are recorded for every hour.

Five or six hours can tell you a lot about a motor's characteristics —but it takes more like five or six *years* to tell you its *character.*

And it's the test of time in which Allis-Chalmers motors have established that they are *great* motors. That's why you hear so many engineers say: "You can depend on Allis-Chalmers Motors!"

• • •

If you could meet and talk with the men who build Allis-Chalmers motors, you might be surprised to learn how keenly they are aware of the big *personal* stake they have in every motor they build for you.

They know that factory tests to fully pre-determine how well a motor is built *just don't exist;* that there's still no substitute for responsible craftsmanship.

And they know that when they build great motors for you they're making *friends*—and that no company and its workers can have too many of them. ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 1726

A-C WE WORK FOR VICTORY WE PLAN FOR PEACE

♪ *Tune in the Boston Symphony, Blue Network, Saturday at 8:30 pm, EWT.*

YOU CAN DEPEND ON ALLIS-CHALMERS MOTORS

PNEUMATIC FORGING HAMMER

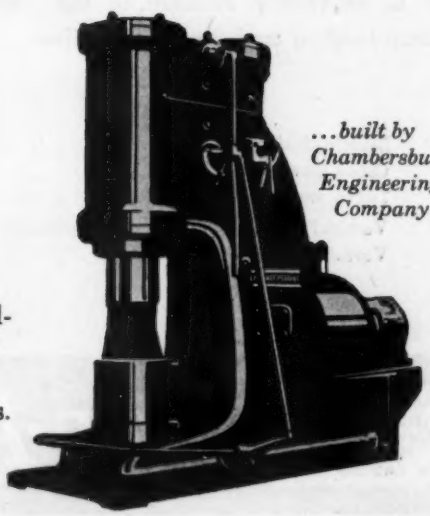
Crankshaft mounted on heavy duty Hyatt Roller Bearings, in separate case, permits assembly of complete drive unit.

Use of Hyatt Bearings eliminates need of bearing adjustments.

To economically forge present day tough carbon and alloy steels, more powerful blows, delivered with greater rapidity, are required of pneumatic forging hammers. The most dependable and efficient in heavy duty bearings is necessary to meet these severe conditions.

We will be glad to assist you with your bearings design problems.

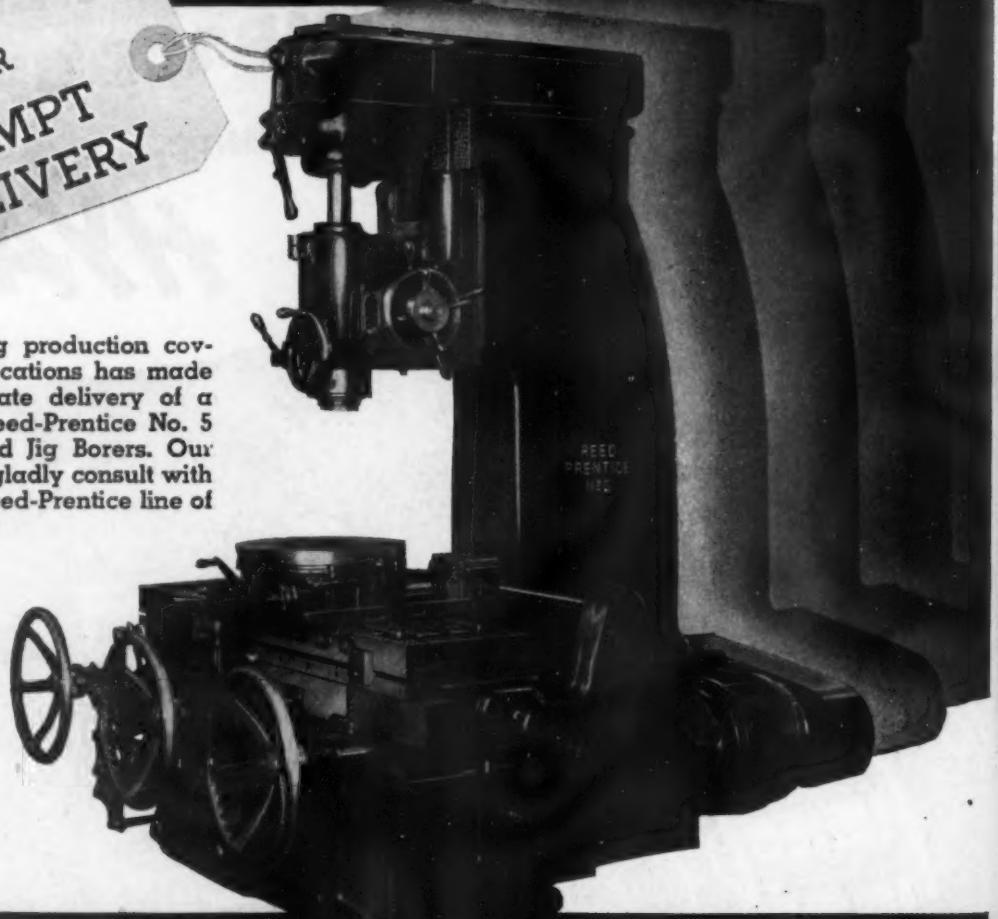
HYATT BEARINGS *Division of* GENERAL MOTORS
HARRISON, NEW JERSEY



...built by Chambersburg Engineering Company

REED-PRENTICE No. 5

OK FOR PROMPT DELIVERY



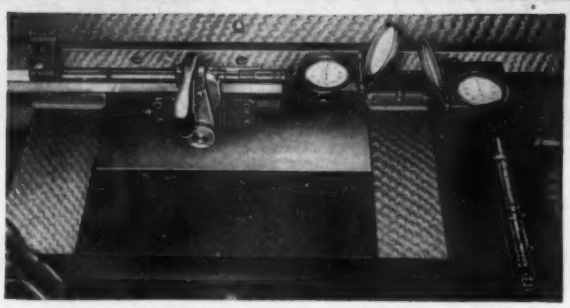
Constantly increasing production covering pool order allocations has made possible the immediate delivery of a limited number of Reed-Prentice No. 5 Milling Machines and Jig Borers. Our Sales Engineers will gladly consult with you relative to the Reed-Prentice line of Machine Tools.

for MILLING ★ ★ ★ JIG BORING

The Reed-Prentice No. 5 Vertical Milling Machine is a fast, rugged, accurate, and efficient miller which will fulfill your most exacting requirements. Used as a die-sinker it is especially efficient in the making of drop-forging and die-casting dies.

SPECIFICATIONS

Longitudinal power feed	48"
Cross power feed	16"
Table working surface	60" x 16"
Vertical adjustment head on column	15"
Vertical feed of spindle	9"



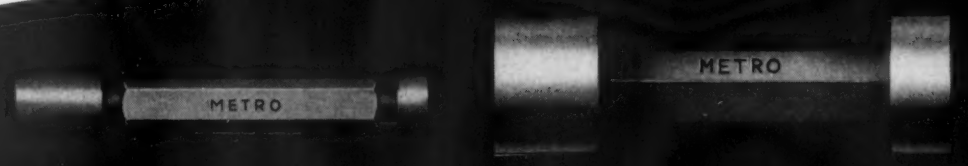
The No. 5 Jig Borer is equipped with precision measuring devices (as shown above) for extremely accurate operations on jigs and fixtures.

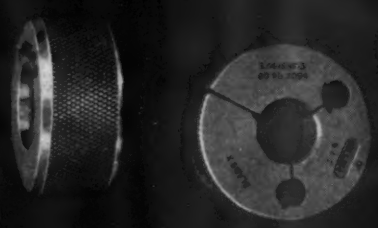
BRANCH OFFICES
1213 W. 3rd. St.
Cleveland. Ohio
75 West St.
New York City. N. Y.

REED-PRENTICE CORP.

MAIN OFFICE
WORCESTER
MASS. U. S. A.

METRO





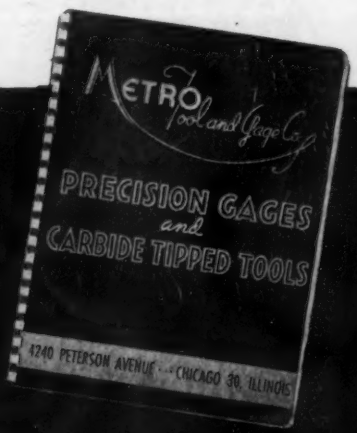
Precision Gages

Carbide Tools

STANDARD AND SPECIALS

To Fill Your Exact Requirements

METRO craftsmanship gives you that extra quality in accuracy, conformance and adaptability to set or maintain top standards in performance and service. You get speedy delivery from available stock on all METRO Standard Tools and Gages. Special Gages and Carbide Tipped Tools to your prints is a METRO feature service. Let our engineers help you solve your next tough machining problem.



Surface Plates

Write for New Catalog No. 102 Today

METRO

TOOL AND GAGE CO.

4240 PETERSON AVE.
CHICAGO 30, ILL.

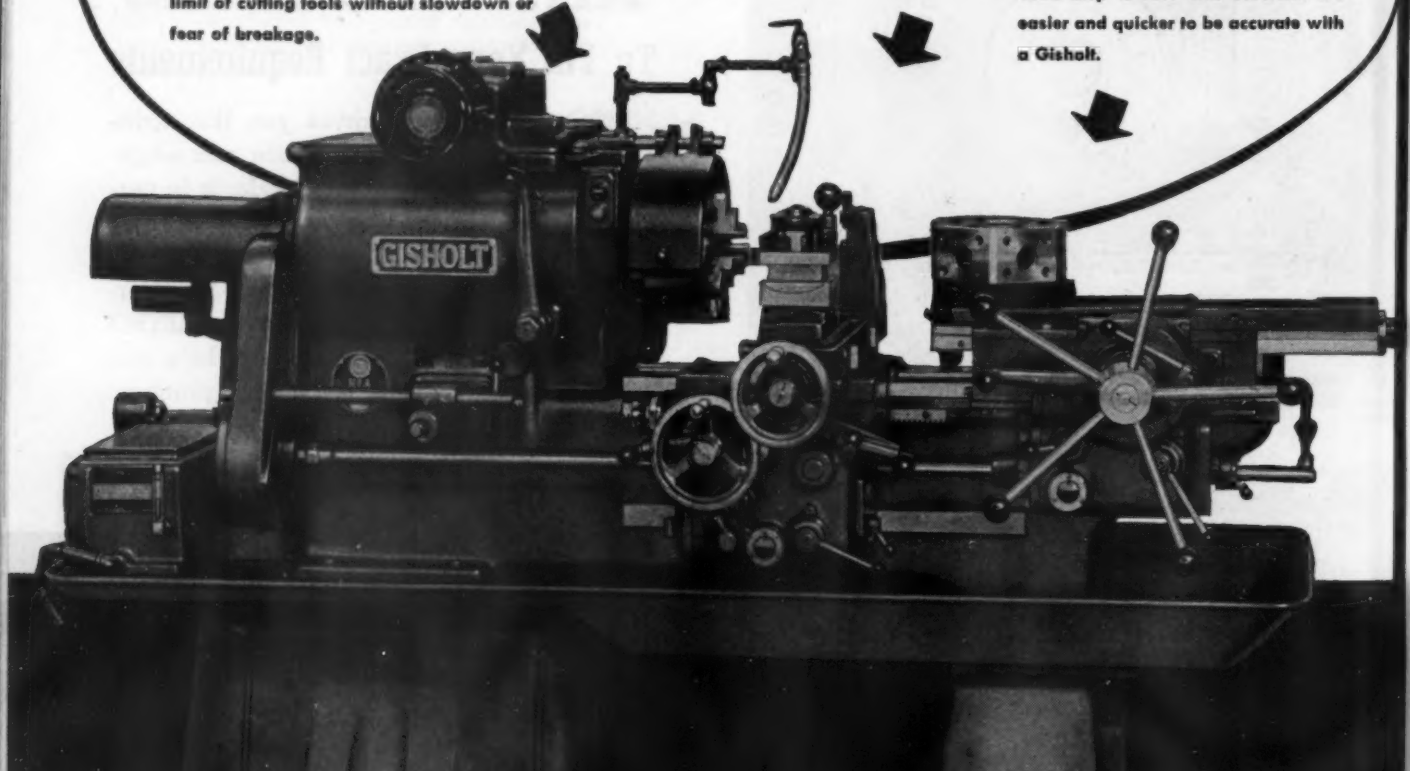
FASTER!

BECAUSE:

1 Finger-tip hydraulic control for starting, stopping, and reversing spindle rotation. Braking is automatic—instantaneous. This smooth, quick-shifting headstock provides a 12-speed change of pace. Here's power enough for every need in multiple cutting. Here's strength to let you work up to the limit of cutting tools without slowdown or fear of breakage.

2 All hand wheels are convenient to tool slides. Cross feeds are clearly graduated in thousandths of an inch. A single movement of a single lever unclamps the square turret and indexes the next tool into cutting position. Positive stops for cross slide carriage are quickly adjustable.

3 Automatic releasing, indexing, and clamping of hexagon turret is a simple, one-hand operation. Twelve movements are abolished on any job using all turret faces. Feed engagement and release are instantaneous. Adjustment between automatic feed trips and dead stop is fast and accurate. It's easier and quicker to be accurate with a Gisholt.



FEED the work to these Gisholt Universal Turret Lathes! Feed it as fast and heavy as you please. They're built to take it—and to deliver new records in cutting floor-to-floor time to boost production schedules.

Fast? Sure, because they're *designed* for multiple cutting and higher cutting speeds . . . because they're simpler to operate . . . because they eliminate waste motion. What's more, the fatigue factor is reduced to a new minimum because many machine functions are automatic.

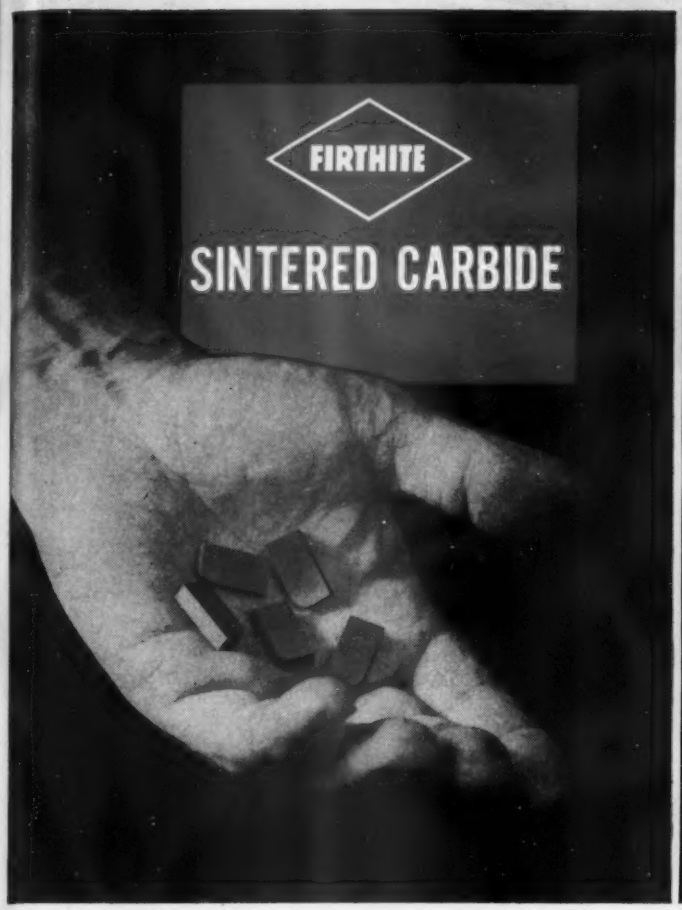
When you want to do the job faster—and better—put it on a Gisholt. Why not get all the facts?

GISHOLT MACHINE COMPANY • *1201 E. Washington Ave., Madison 3, Wis.*

Look Ahead...Keep Ahead...With Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES



THERE ARE PLACES FOR BOTH . . .

Firth-Sterling, long specialists in making steels for shop tooling, early recognized the possibilities of carbides as a means of extending the improvement in shop practice brought about by the super high-speed steel—CIRCLE C. **But, there is a place for both . . .**

Where the highest speeds are obtainable or materials are hardest, FIRTHITE is the "last word" in a cutting material. It is used at speeds up to ten times those possible with high-speed steels. Where speeds above average are permissible or materials are "on the hard side," CIRCLE C will cut *at least* 25% faster than ordinary grades of high-speed steel. Send for descriptive literature on these remarkable materials.

For instance:

FIRTHITE *removes* 730 pounds of gray-iron casting metal per hour instead of 180 pounds;

drills a gun barrel in 23 minutes instead of 1 hour;

enables milling-cutters to run at 1,000 feet per minute instead of 100 feet with previous materials.

For instance:

CIRCLE C *machines* hard die blocks in 28 hours instead of 42 hours . . . doubling production between grinds — versus regular high-speed steel;

turns two to ten times more pieces of heat-treated alloy steel between grinds than other high-speed steels.

Firth-Sterling
STEEL COMPANY

Solving difficult production problems for American industry has been the business of Ex-Cell-O since its inception twenty-five years ago. Often this has entailed the development of special purpose machines for single and multiple operations . . . to do work faster, more economically, and with a much higher degree of accuracy. Where the quantities have justified it, Ex-Cell-O has not only designed and built special machines to produce parts of improved quality but has undertaken actual production and assembly of these parts in its own plant. The suggestion is made that, insofar as is practicable, *your* postwar planning be started early. Ex-Cell-O's extensive facilities are at your disposal. Write to Ex-Cell-O in Detroit today.

EX-CELL-O CORPORATION • DETROIT

An Ex-Cell-O 25th Anniversary Book, illustrated above, has just been printed. If you would like a copy just write to Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit 6, Michigan.

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • BROACHES AND BROACH GRINDING MACHINES • HYDRAULIC POWER UNITS

from 1919 *to* 1944...a quarter century of engineering and production achievement

EX-CELL-O *"Firsts"*

EX-CELL-O was the first company in the United States to design and manufacture and introduce for successful commercial use . . .

. . . a precision ball bearing internal grinding spindle

. . . a horizontal-type precision boring machine

. . . a precision thread grinding machine

. . . a precision cylinder boring machine

. . . a 1½ horsepower compact hydraulic power unit

. . . a Diesel fuel injection pump and a universal-type Diesel engine nozzle

. . . a machine to form and fill automatically square paper milk bottles in the dairy

EX-CELL-O was also the first American company to undertake the mass production of hardened and ground precision parts for aircraft engines.

XLO

EX-CELL-O *for* PRECISION

GRINDING SPINDLES · DRILL JIG BUSHINGS · CONTINENTAL CUTTING TOOLS · TOOL GRINDERS · DIESEL FUEL INJECTION EQUIPMENT · R. R. PINS AND BUSHINGS · PURE-PAK MILK CONTAINER MACHINES · PRECISION AIRCRAFT AND MISCELLANEOUS PARTS

FEDERAL

BEARINGS

Industrial

Automotive

Aircraft

Naval

Military

Federal Quality ball bearings have gone to war . . . in the air, in military vehicles and at sea.

They are also doing an outstanding job for Uncle Sam in plants and factories producing war material.

WHEN VICTORY IS WON FEDERALS WILL AGAIN BE AVAILABLE FOR PEACE-TIME SERVICE

TRADE MARK

THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT

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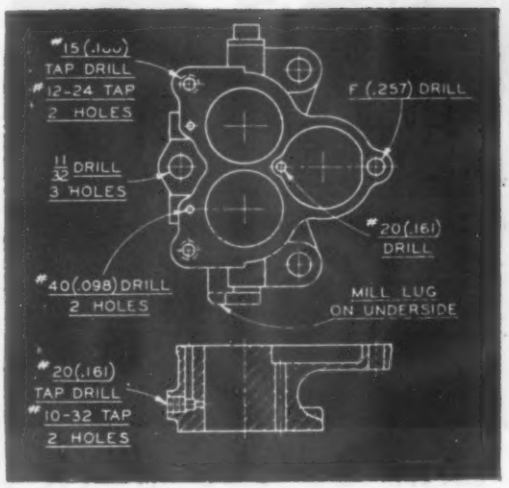
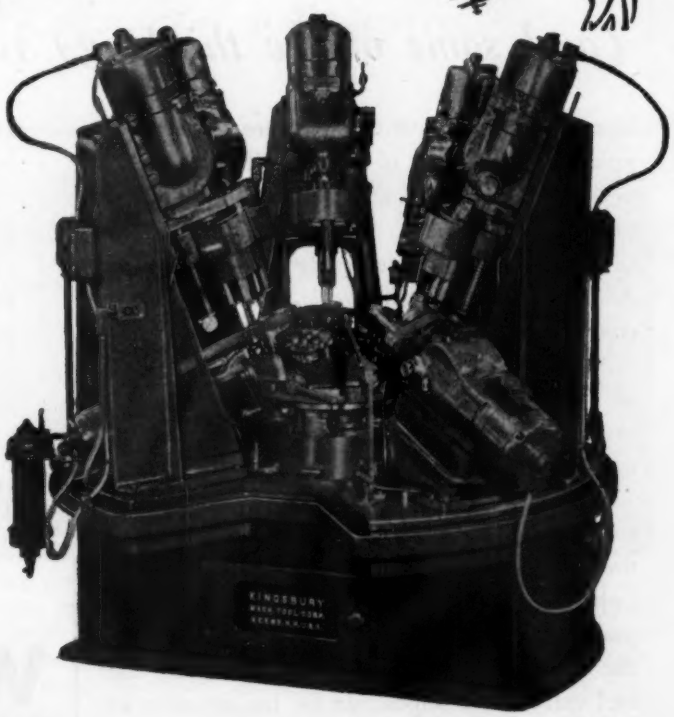
FLEXIMATIC

The THRIFTY Way

To Solve Production Problems



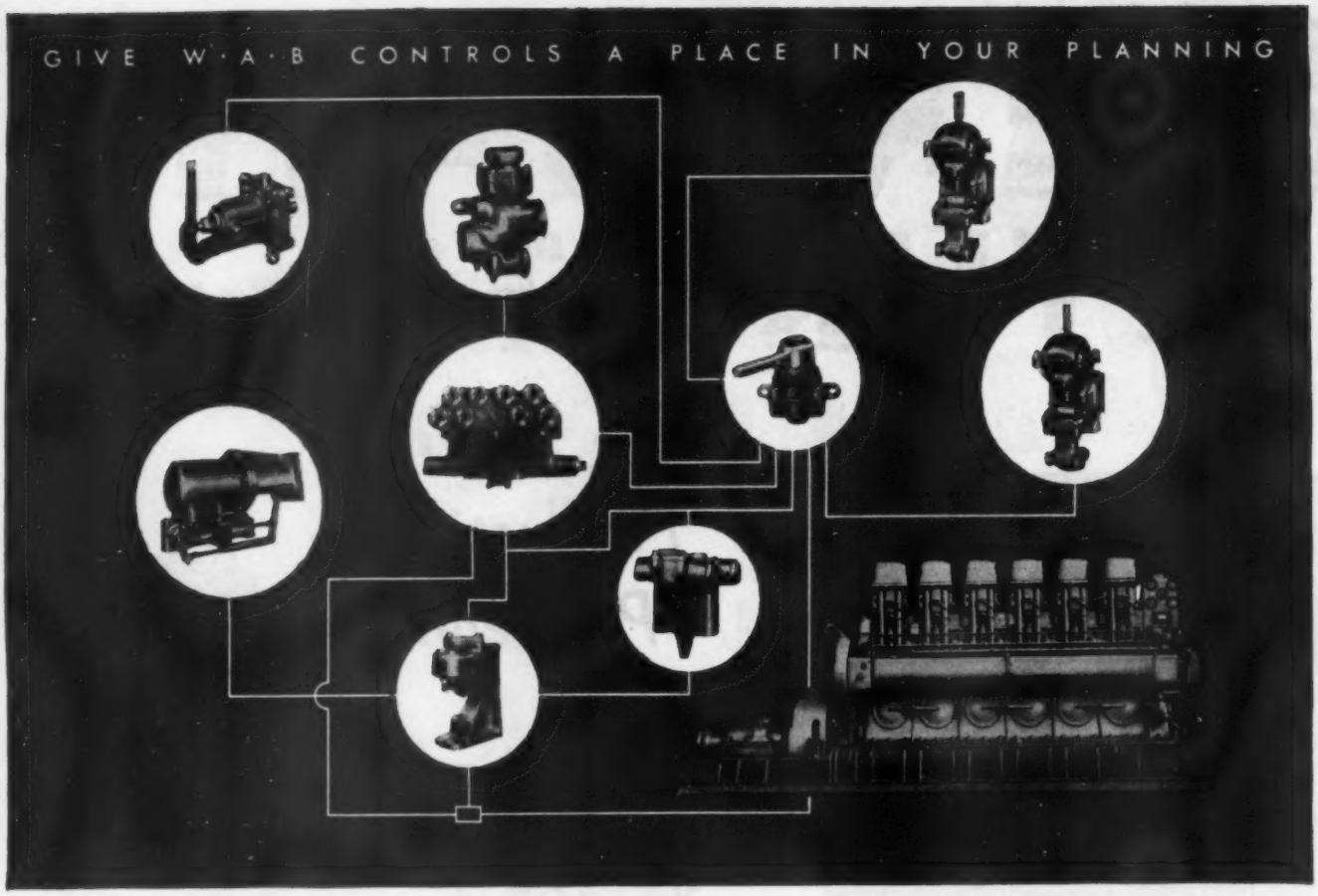


Over a dozen operations on the carburetor throttle valve bodies shown — and Kingsbury FLEXIMATICS perform the entire job in a single chucking of the work! An example of the thrifty way to solve multiple-operation production problems.

FLEXIMATICS are built up of standard Units, set up on a standard base around an automatically indexing work-holding turret. This unit system of construction keeps first costs low—out of the "special machine" class. And in addition, FLEXIMATIC Units can be changed, moved around and mounted in any combination on the base to meet the machining requirements of many different parts. That is why we say that **flexible automatic** FLEXIMATICS are the THRIFTY way to solve production problems.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U.S.A.



Here are the **W·A·B** devices that do the work *(and some of the thinking)* in engine maneuvering

The jobs that W·A·B Controls are already doing give the best picture of their possibilities . . . and of how easily they may be designed into *your* planning.

Consider this giant reversing diesel, for instance. Adding the few small W·A·B devices pictured completely revolutionized the engine control.

All engine operations are governed by movement of a small handle. Movement of the handle in the operating quadrant produces sequential movement of the actuating mechanism.

Moving the handle through the neutral position to the opposite quadrant successively cuts off the fuel; shifts the cam shaft; admits starting air (which brakes the engine, if it has not completely stopped rotating); starts the engine in the reverse direction, and—finally—opens the fuel valve. It is impossible for the operator to alter this sequence and damage the engine. Related functions of the driven machinery can also be tied into the control system, and safety interlocks easily incorporated.

If you are thinking about improvements in your product or your production equipment, where a remote control problem is involved, you'll find it profitable to give W·A·B Controls a place in your planning.

Westinghouse Air Brake Company

INDUSTRIAL DIVISION

General Offices: Wilmerding, Pa.

75 Years of Pneumatic Control Experience

W·A·B

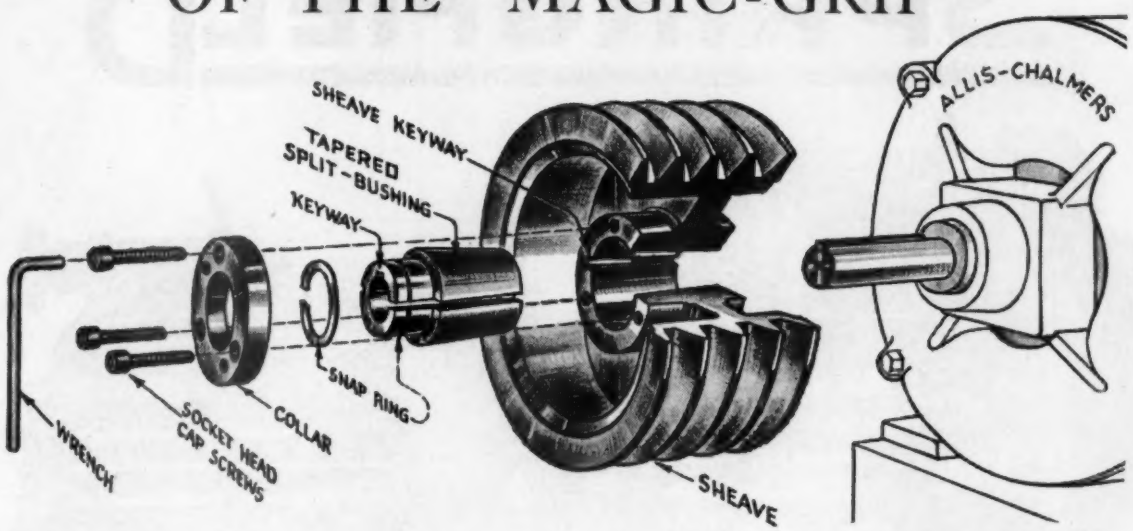
1869 1944

Pneumatic . . . Pneumatic-Electric . . . Pneumatic-Hydraulic

remote control systems

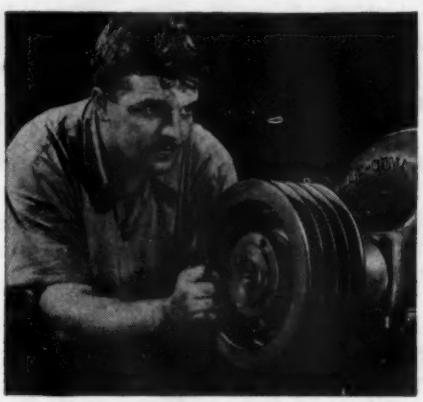
Here's the Secret

OF THE "MAGIC-GRIP"

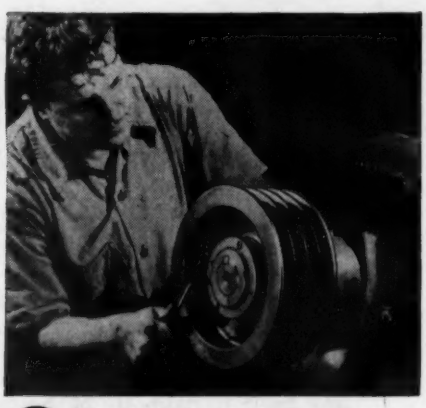


Exploded view shows why Allis-Chalmers' new "Magic-Grip" Sheave goes on *as a unit in 3 easy steps.* It's the fastest mounting sheave on the market—at no extra cost.

1 Place sheave on shaft. Slides on smoothly because clearance is provided by expanded bushing. There's *no* hammering — *no* forcing! Complete sheave and bushing unit comes intact—ready for quick, easy mounting.



2 Slide to desired position. Sliding easily, sheave can be placed *exactly* according to straight-edge . . . giving you true alignment with resulting smooth performance. A minimum of time is required.



3 Tighten three capscrews — and it's ready to go! Entire sheave is locked securely to shaft and *grips like magic!* No set screws to damage shaft. Send for Bulletin B6310. Allis-Chalmers, Milwaukee 1, Wis.

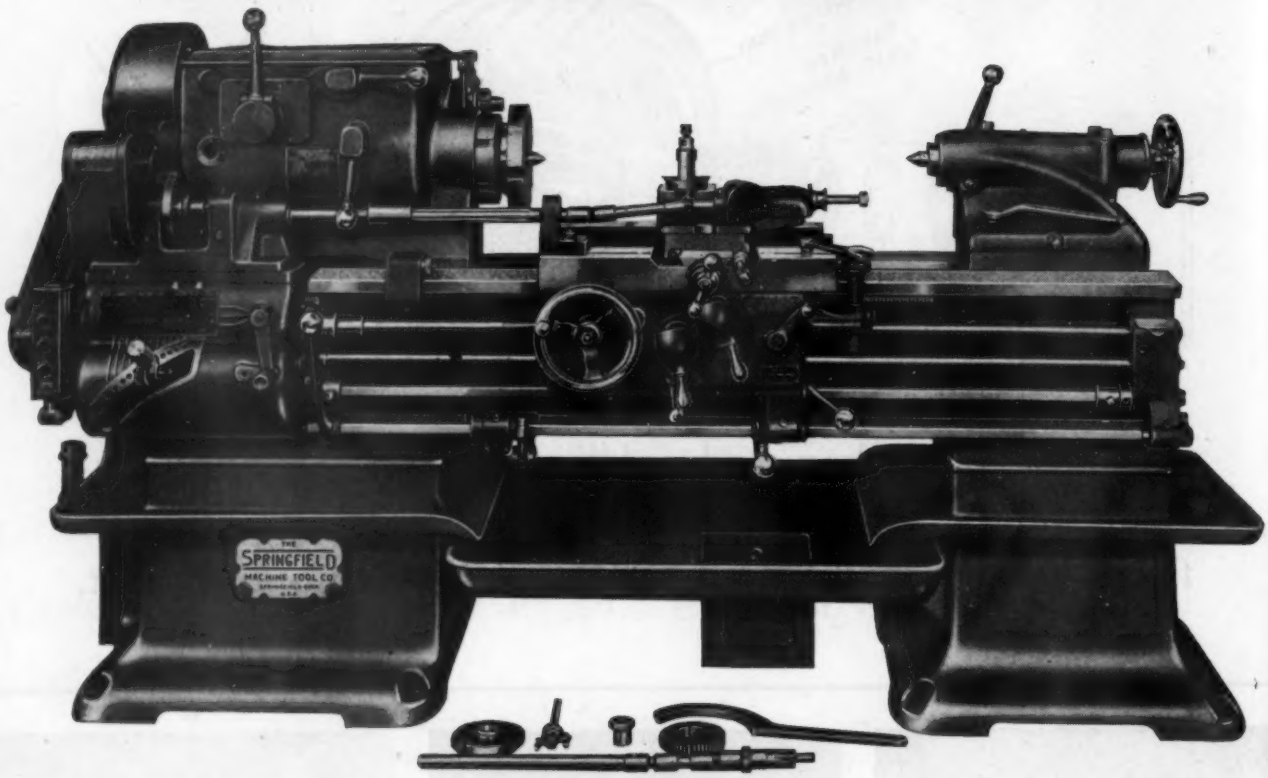
A 1764

Allis-Chalmers Texrope

"MAGIC-GRIP" SHEAVES

Choose

SPRINGFIELD



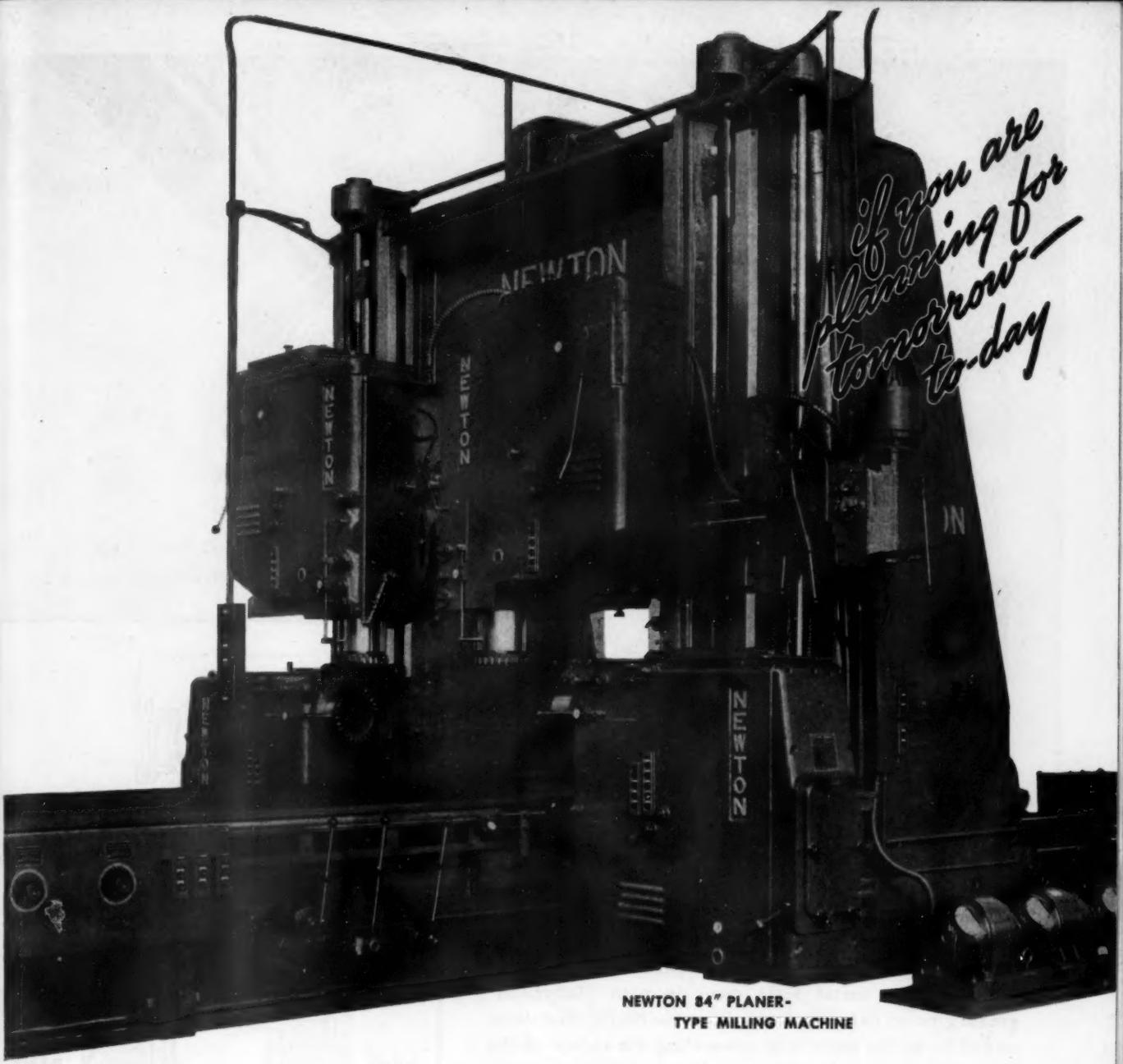
GEARED HEAD LATHES

From the ground up, a SPRINGFIELD Lathe represents superior construction and design. All heavy castings, including the bed, are cast in our own shop . . . gearing is designed for maximum efficiency . . . . attachments demonstrate unusual engineering ingenuity . . . lubricating systems and power transmission are built to take it, 24 hours a day. In fact, to fully understand what SPRINGFIELDS can do for you, check their superior metal turning records in other shops . . . and judge for yourself.

Under current emergency conditions make it SPRINGFIELD Geared Head Lathe . . . they'll do your job better, now and later, too! Sizes range from 14" to 30". Write concerning deliveries, prices, etc.

The SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD OHIO U.S.A.



NEWTON 84" PLANER-
TYPE MILLING MACHINE

TODAY'S WAR HORSES . . . . PEACE-TIME WORK HORSES

CONSOLIDATED has always held to one unfaltering purpose . . . to build into its machines the utmost in long-lasting, trust-worthy performance, and maximum productiveness.

In these days, when machines are unceasingly pushed to their production capacity limits, these CONSOLIDATED characteristics stand out as of even greater importance than before.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOLS

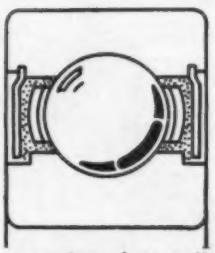
CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK

DAM THE DIRT!

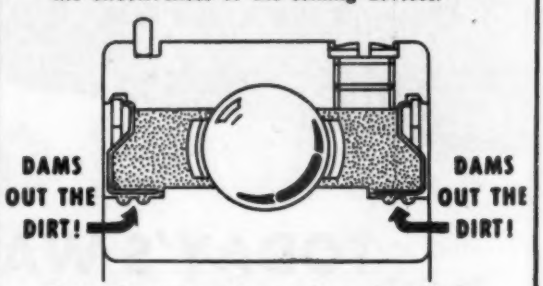
Dirt is the curse of every user of motors and machines. In shop and factory it gets into the average bearing, where it destroys the high finish, abrades the polished surfaces, creates friction that results in vibration, looseness and noise. And its action is cumulative—once started, it leads to premature bearing failure.

In the NORMA-HOFFMANN "CARTRIDGE" BALL BEARING, wearless metal seals combine with "labyrinth" grease grooves to form a highly effective barrier that dams out dirt—at the same time preventing the escape of the lubricant packed in the extra large grease reservoir afforded by the double-row width of the bearing. As a result, the initial high anti-friction efficiency of the "CARTRIDGE" BEARING is maintained over extremely long periods.

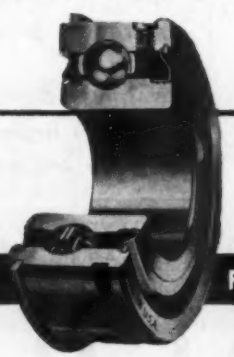
NOTE:—Many representative motor, machine and tool builders are incorporating the "CARTRIDGE" BEARING in their products. When you buy such units, ask for the NORMA-HOFFMANN "CARTRIDGE" BALL BEARING.



This shows a section of an ordinary single-row "shielded" ball bearing, with its space restrictions limiting the grease capacity and the effectiveness of the sealing devices.



Here, in contrast, note how the "CARTRIDGE" BEARING double-row width not only affords at least 100% larger grease capacity than the ordinary single-row "shielded" bearing, but also permits the use of a highly effective and wearless seal.

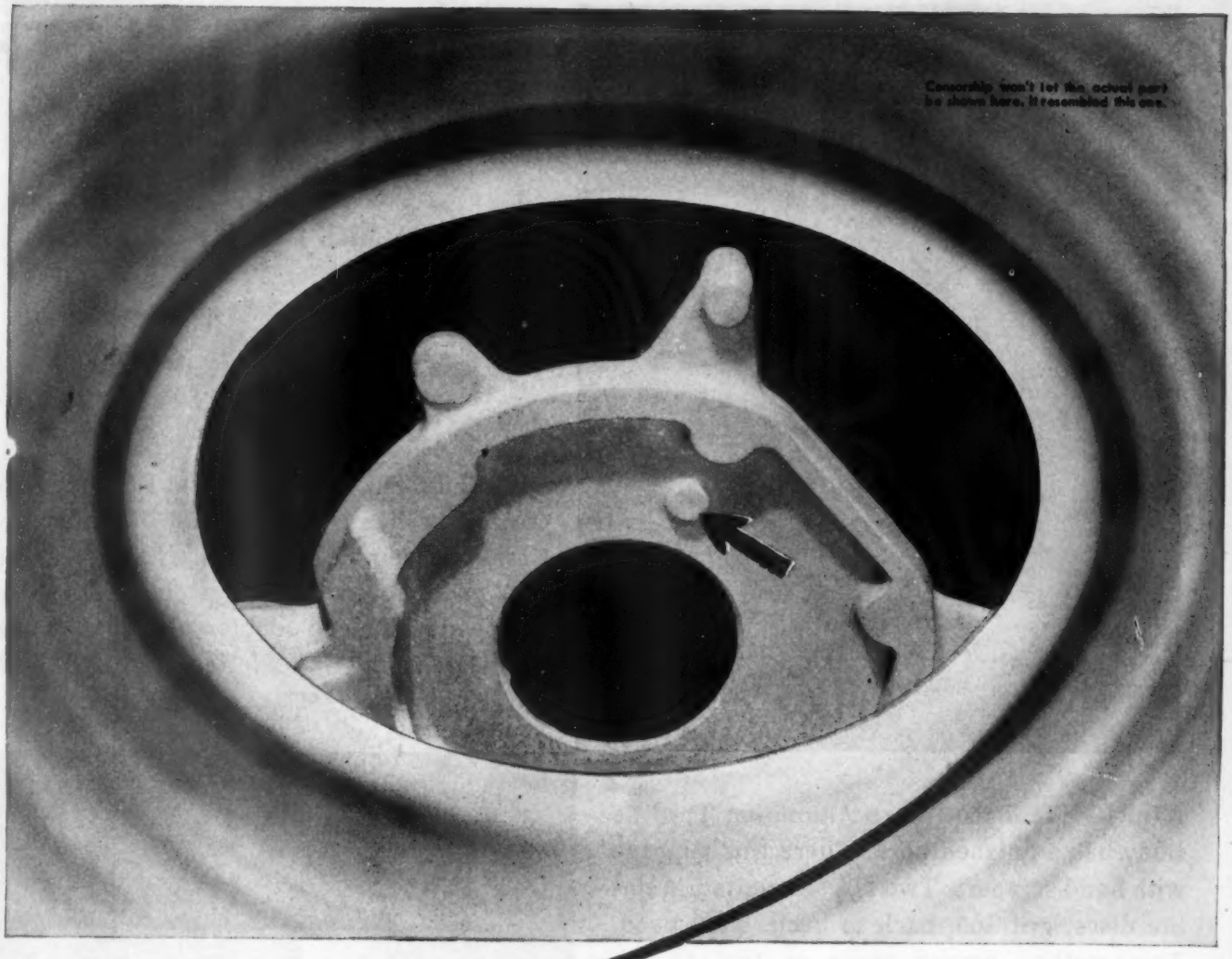


NORMA-HOFFMANN

"CARTRIDGE"
BALL BEARING

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN. FOUNDED 1911

TO WIN THE WAR: WORK—FIGHT—BUY WAR SAVINGS BONDS!



The boss was a troublemaker, until...

Examination in Alcoa's stress-analysis laboratory disclosed that the boss was a "stress concentrator". Having determined that here was the source of trouble which showed up in service, the part was redesigned. The fault was corrected.

Bosses, ribs, and the like, have a definite purpose. But when they are found to cause excessive stress concentrations, Alcoa's research men seek some way of distributing the stresses more uniformly. Our engineers may recommend a better blending of the sections, more metal here, less there. Then new parts, incorporating those suggestions, are given a stress analysis. Checked "O.K.", the piece is ready for test.

With research like this provided by Aluminum Company of America, manufacturers have been better able to get into production fast. Fighting equipment on land, in the air and on the sea is more dependable, because vital Alcoa Aluminum and magnesium parts were thus proved dependable. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA ALCOA ALUMINUM **ALUMINUM**

METALITE CLOTH SLOTTED DISCS

3/8 to 6 inch diameters

Speed War Jobs

AT LEFT: This stainless steel Fuel Line was previously hand-scraped and hand-sanded. Now, one spindle equipped with 3/4" slotted Disc, grit #100, does the inside edge. And, equipped with a cup adaptor, also does the outside edge using 1 1/8" Slotted Disc, grit #120. Production is up 350%.

AT RIGHT: This 2-Bore Aluminum Throttle Body has a finished bore. There was slippage with hand scrapers. Two 1 1/2" unslotted Metalite discs, grit #60, back to back, were used. This method proved twice as fast as the former hand scraping.

▲

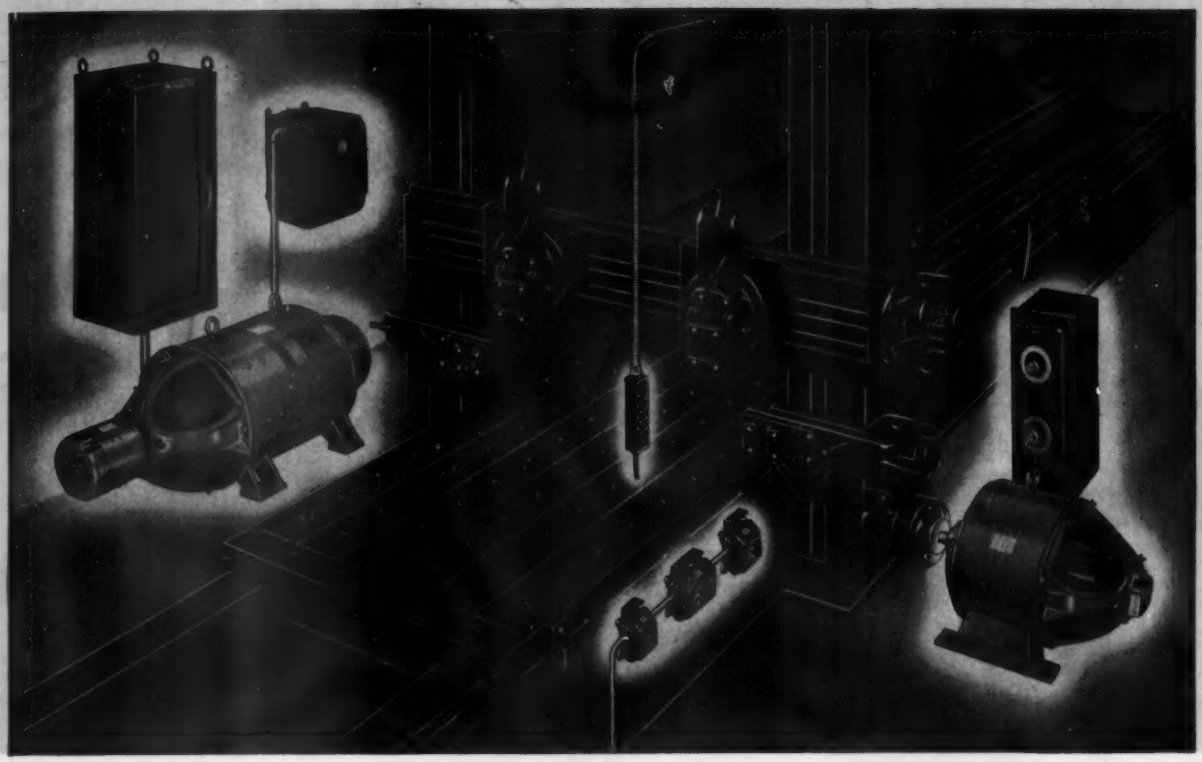
BELOW: In this illustration 5" Slotted Discs, grit #100, are used to put 1/16" radius on the edges of these Magnesium 3-Bore Throttle Bodies. This saved tooling and additional machines. Time, 3 bores, .68 of a minute.

These SLOTTED DISCS, in almost endless sizes and grits, are but one of many Metalite Cloth "Gadgets" ready for instant use on power tools. We'll gladly help you select the proper "Gadgets" for improving a wide variety of your own sanding and finishing operations. Write us.

▲

BEHR-MANNING · TROY, N.Y.

(DIVISION OF NORTON COMPANY)



Planing the Humps OFF THE SPEED CURVE

A planer only earns its salt in one direction—the cutting tool gets a free ride on the return trip. This can't be avoided—but the time losses in reversing and retracting can. Then there are the usual losses from speed changes due to hard spots and interrupted cuts. All these add up to lost machining time—fewer cutting strokes per minute. To take these lost-time humps out of the speed curve requires close, accurate control, a wide speed range and smooth, quick reversals.

Westinghouse direct-current variable voltage planer equipment does all this—and more, too. Standard equipment provides wide variation in speeds over a range of 30 to 1, and includes the patented Westinghouse Rototrol speed control.

Planing up to shoulders and in blind pockets is possible, because it reverses to a line. Variations in load won't change the speed . . . slow speeds won't stall the machine.

This equipment forms a complete variable voltage drive system for planers, millers, slotters and other reciprocating-motion machines. It is only one of many examples of how Westinghouse has put the "machine" in machine tools, through efficient machinery electrification. This ability to provide simple electrical solutions to complex mechanical problems is yours for the asking. Just call your nearest Westinghouse office. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. J-21308

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

THE MACHINE IN MACHINE TOOLS

Typical small parts that are successfully deburred by Roto-Finish Process.

DE-BURR MECHANICALLY!

Loading parts and Roto-Finish Grinding Chips into a Roto-Finish Machine. The larger picture shows the Roto-Finish department—a Defense Plant Corporation installation that saves the work of many hands and boosts production tremendously.

MASS production mechanical deburring at a prominent aircraft parts manufacturing plant in Detroit proved so satisfactory that today an entire Roto-Finish department has been developed.

The speed-up in production and amazing savings are typical of the advantages of Roto-Finish in hundreds of war plants. Working equally well on large and small parts of steel, brass, aluminum, magnesium, stainless and nickel steels, it is natural that Roto-Finish offers tremendous possibilities for peacetime production, too!

For your reconversion planning—be sure to have full details about this new production technique. Send for literature—and we'll be glad to receive sample parts for processing.

ROTO
THE STURGIS PRODUCTS CO.
STURGIS • MICHIGAN
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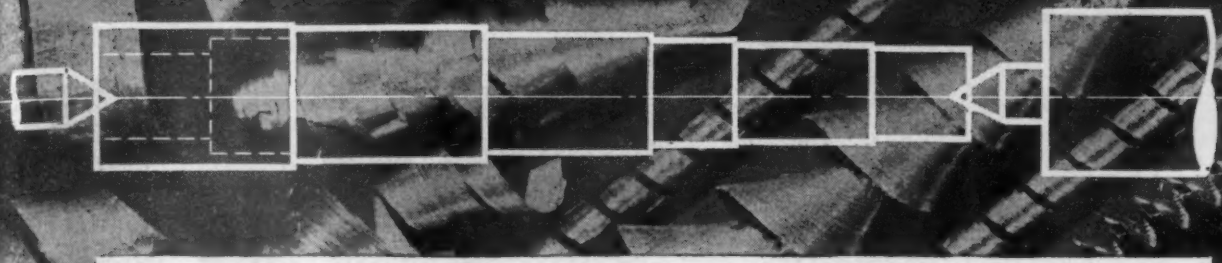
FINISH

THE STURGIS PRODUCTS COMPANY
208 JACOB STREET, STURGIS, MICHIGAN



CUTS 23% MORE CHIPS *per hour*

with Monarch Automatic Feed Changes!

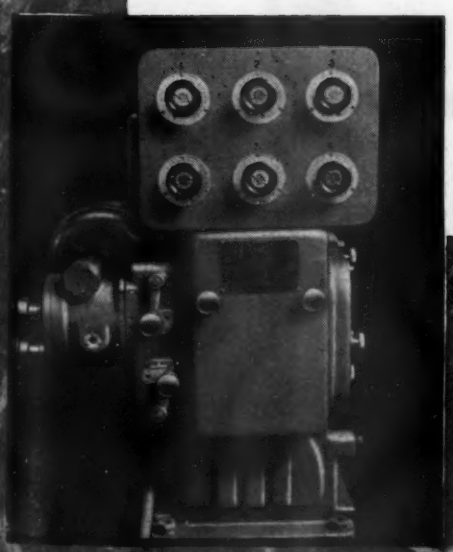
Machining time on this shaft was cut 23%, by using Automatic Feed Changes on a "Monarch Automatic Sizing Lathe". This substantial time saving is especially important today . . . and also indicates how costs can be cut with modern equipment. This 23% saving will be multiplied by the number of machines attended by each operator.

This specific job has five diameters, with feed rates automatically ranging from ½" to 2" per minute, determined by the depth of cut. Without Automatic Feed Changes, all diameters would be machined at the feeding rate for the starting diameter.

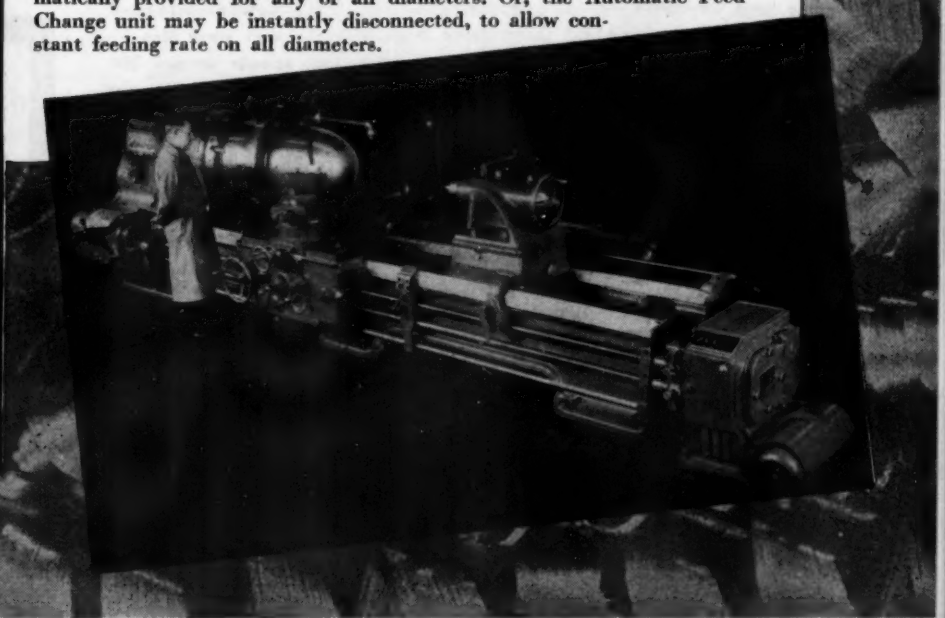
Monarch Automatic Sizing Lathes, with Automatic Feed Changes, have many applications for step shaft turning and similar work. Our engineers are at your service to see if their advantages can be applied to your work to save time and reduce costs.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

MONARCH LATHES
Save Time



Automatic control mechanism is centered in the cabinet which houses the necessary rheostats to control the speed of the 4 to 1 d-c motor driving the entire feed unit. Any desired feed, from lowest to highest, is automatically provided for any or all diameters. Or, the Automatic Feed Change unit may be instantly disconnected, to allow constant feeding rate on all diameters.



KENNAMETAL *Lathe File Does as Much Work as 150 Mill Cut Files*

...AND PRODUCES A BETTER FINISH!

Comparative service tests continue to prove convincingly that Kennametal lathe files multiply production, improve quality of work, and effect substantial savings in the cost of files used. For example, on the job illustrated above:

A mill cut steel file, employed to remove the sharp edges from the 400 Brinell steel part, wore out on about 100 pieces. A Kennametal lathe file turned out 800 pieces the first day—stayed on the job two weeks — and produced 15,000 pieces. The Kennametal file cut a curling chip — did not scrape or skid — and provided a finish that was almost as smooth as a grinding job!

Kennametal files outlast steel files 50 to 200 times, because their surface is made of the same hard, cemented carbide composition as steel-cutting Kennametal-tipped tools. They permit filing speeds 3 to 10 times those possible with steel files — doing an outstanding job on cast iron and brass at surface speeds around 900 feet per minute, and on high-carbon, high-chromium steels at 800 surface feet per minute. The keen, sturdy teeth of a Kennametal file will make a clean, true cut on steels up to 62 Rockwell C, a hardness that ordinary files cannot touch.

The value of any tool is measured by the quality and quantity of work it produces. The higher original cost of Kennametal lathe files is insignificant compared to the tremendous economies effected through their use. Order one today for test purposes—let it prove its merit in your shop.

Kennametal Lathe Files are now furnished in two sizes—11" or 14" long—and each size is available with either 20 or 30 teeth per inch. The 11" size (F-76—30 teeth/inch; F-77—20 teeth/inch) having a filing surface 4" long x ¾" wide, costs $12.50. The 14" size (F-86—30 teeth/inch; F-87—20 teeth/inch) having a filing surface 6" long x ¾" wide, costs $18.50. All sizes can be shipped promptly.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc. LATROBE, PA.

....MAKING LIGHT WORK OF A BIG JOB ON A SUPER SERVICE RADIAL

This 8 ft. 19 in. column Super Service Radial has been serving a well-known Canadian plant for more than three years—doing heavy work in a big way. Yet this machine has performed with remarkable ease because it is amply powered, and all controls, centralized at the head, are within easy reach of the operator.

Centralized control has been developed to a high degree on the Super-Service Radial. All speed changes in the head, power rapid traverse, easy swinging arm, power clamping of column, power and elevation and electric arm clamping can be manipulated with maximum convenience and minimum effort, thereby making more time available for drilling.

Write for your copy of Bulletin R-24 which contains valuable information on these modern, fast, powerful machines.

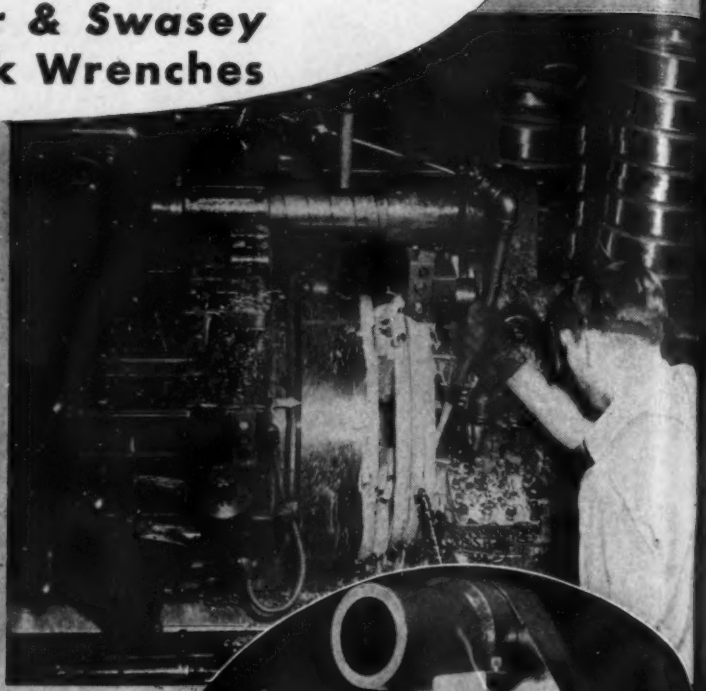
ARMY E NAVY

The CINCINNATI BICKFORD TOOL CO.

OAKLEY, CINCINNATI 9, OHIO, U.S.A.

Save Time and Plenty of it

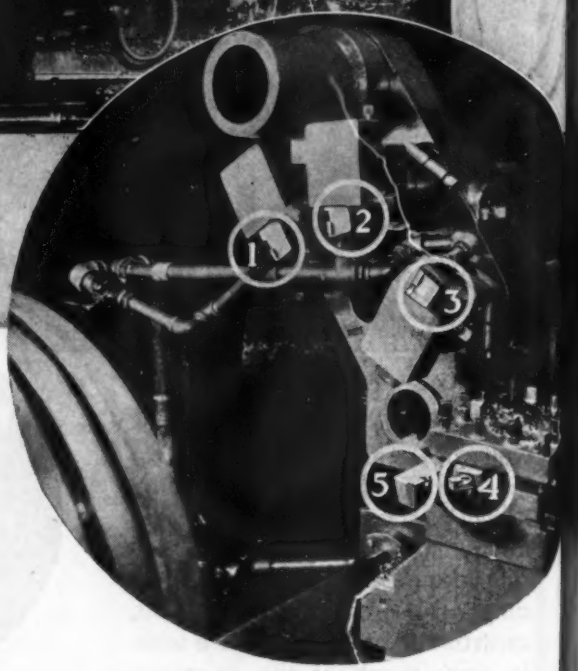
with Warner & Swasey Power Chuck Wrenches



A turn of a knob chucks this large ring forging.

Chips fly under heavy multiple cuts at high speed.

Five simultaneous cuts (see photo) on tough steel forgings require maximum chucking grip that only a power chuck wrench can give.



AT The Steel Improvement & Forge Company, Cleveland, Warner & Swasey Power Chuck Wrenches are saving better than 60% chucking time on heavy ring and crankshaft forgings.

Hand chucking—heaving with an extension on a hand chuck wrench—is back-breaking work and takes all of 3 minutes per piece. Warner & Swasey Power Chuck Wrenches are chucking these pieces in about 55 seconds. All the operator need do is turn the convenient control knob—as easily as turning a door-knob—to get the proper chucking pressure.

The work involves deep, wide cuts that, at 140 surface feet per minute, take a lot of metal off tough steel forgings that have been heat treated to 302 to 321 Brinell hardness. In one operation, five heavy cuts are made simultaneously—totaling 1⅜" in width by ⅛" in depth. In another, a heavy interrupted facing cut is made. These time-saving operations would be impractical—yes, impossible on pieces chucked by manual strength. The piece would slip, tools would be broken, work spoiled.

Learn what Warner & Swasey Power Chuck Wrenches can do for you

Here's a way to make work easier for your operators, reduce "fatigue-sag", and get faster production and closer finished pieces on heavy duty turning. A Warner & Swasey field engineer will be glad to study your metal turning operations and advise you on the results which you may expect by putting Warner & Swasey Power Chuck Wrenches on your current model turret lathes. Call the nearest Warner & Swasey representative or write Warner & Swasey, Cleveland 3, Ohio.

WARNER & SWASEY
Cleveland

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS....WITH A WARNER & SWASEY

TURRET LATHES, SADDLE AND RAM TYPES—CHUCKING AND BAR TOOLS—TAPPING AND THREADING MACHINES

Let's Face It

IT IS NO SECRET that war production has passed its peak.

To say that is not to minimize the size and seriousness of the job yet to be done.

The invasion already has disclosed the need for more tanks and heavy trucks and output is to be expanded abruptly.

Other requisites at the front undoubtedly will develop. Industry must be geared to meet them.

But the sudden cancellations of Brewster plane contracts were the tip-off of the trend that will become more pronounced as the weeks go by.

Strange and amazing as it appears, we have been successful beyond our fondest hopes, and beyond the conception of Hitler and Tojo, in supplying our military and naval units with what they wanted.

In many categories our main job from now on will be to take care of replacement requirements.

The pipelines of certain items to the battlefronts are filled and we shall have to put in at this end only what is used at the other end.

With the invasion still in its initial stages and with a gigantic undertaking in the Pacific facing us, it is hard to grasp this fact. It is well, however, that we do.

We must be prepared to deal intelligently and decisively with future cutbacks and cancellations. We cannot afford to come up to the end of the war with Germany—an end that might be sudden and unexpected—unprepared for the period of readjustment that inevitably will follow.

Under the circumstances the newly announced policy of the War Production Board pertaining to materials and plant equipment for civilian goods makes good sense.

Manufacturers now have the right to apply for and obtain enough material to make and test a working model of any product planned for postwar production.

Beginning July 1 manufacturers may purchase machinery, tools and dies for civilian output from existing surpluses or by placing orders to be filled when they do not interfere with war production.

This action is a step in the right direction. The nation discovered it was impossible to stop producing refrigerators one day and begin making machine guns the next day.

If anything, the complications are greater in turning from war to peace than in converting from peace to war.

Whatever can be done to ease the shock, to shorten the reconversion time, to keep people idle a minimum period, to hasten the retooling process, is all to the good.

This first official approach toward preparations for reconversion suggests the desirability of putting into effect three other moves.

The government should put a price on the equipment it owns and allow manufacturers with an option to purchase it to decide at once how much of it they will want to retain.

Congress should enact without undue delay legislation implementing the Baruch-Hancock report, thus establishing a program for terminating war contracts and disposing of surplus property.

Most important of all, government agencies should have ready plans for removing machinery and materials from war plants immediately upon contract termination, clearing factory floors for installation of equipment intended for manufacture of civilian goods.

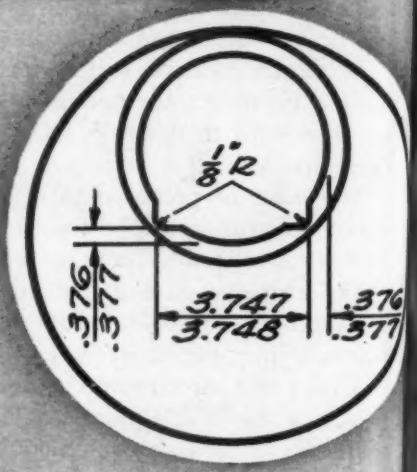
Burnham Finney

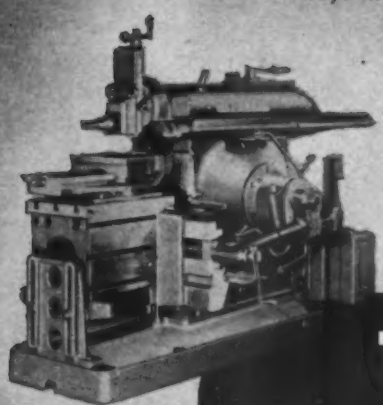
INTERNAL SHAPING...

In the field of internal shaping alone, Cincinnati Shapers are used on a long list of "hard to get at jobs"—from cutting internal key ways to cutting symmetrical and non-symmetrical holes.

We show a Cincinnati Shaper shaping internal key ways in a blind hole—a "hard to get at job." Remember, a Cincinnati Shaper, the tool of many uses, will always be busy in your shop.

Write for Catalog N-2, describing these powerful accurate Shapers.





THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

WHAT'S AHEAD IN Metal Stamping

WAR HAS GIVEN stamping engineers an opportunity to do what they have always felt they could do—prove the practicability of using stampings for many parts and products formerly made of forgings and castings.

What's more, these same engineers have proven that stampings can be produced with enough accuracy to meet many close fitting and precise requirements. Too, they have proved that parts so produced can be made with lower costs and considerably faster than by many other processes. Those lessons learned about stamping and pressing metals during the war are certain to have reverberations in postwar industry.

It would have been a farsighted individual, indeed, who could have forecast a few years ago that such an item as a submachine gun would be formed almost completely of stamped and press formed parts. Too, it would have taken a heap of persuasion to convince many production men that the combined tolerances of a number of stamped pieces joined together could be less than provided through

METAL-WORKING TOMORROW

—There are some who say that were it not for the fact that stampings were able to replace forgings and castings our war effort would have suffered. How some of the advances in stamping will affect production is told here

other high speed production processes. This is true, and is being proved daily.

The aircraft industry pushed development of new and better techniques in metal pressing, especially of large parts, but other industries were quick to adopt these techniques and develop new ones of their own. Ancient prejudices and beliefs had to be pushed aside when shortages of metals and machine tools became so desperate that many expedients had to be tried. The insistent urgings of spokesmen for pressing and stamping could not be ignored. That their faith in themselves was justified is a well proved fact. Some people will go so far as to say that were it not for the ability of stamping engineers to achieve some near miracles, our war production effort might have failed. It is certain that stampings saved metal and relieved, somewhat, the great pressure for machine tools.

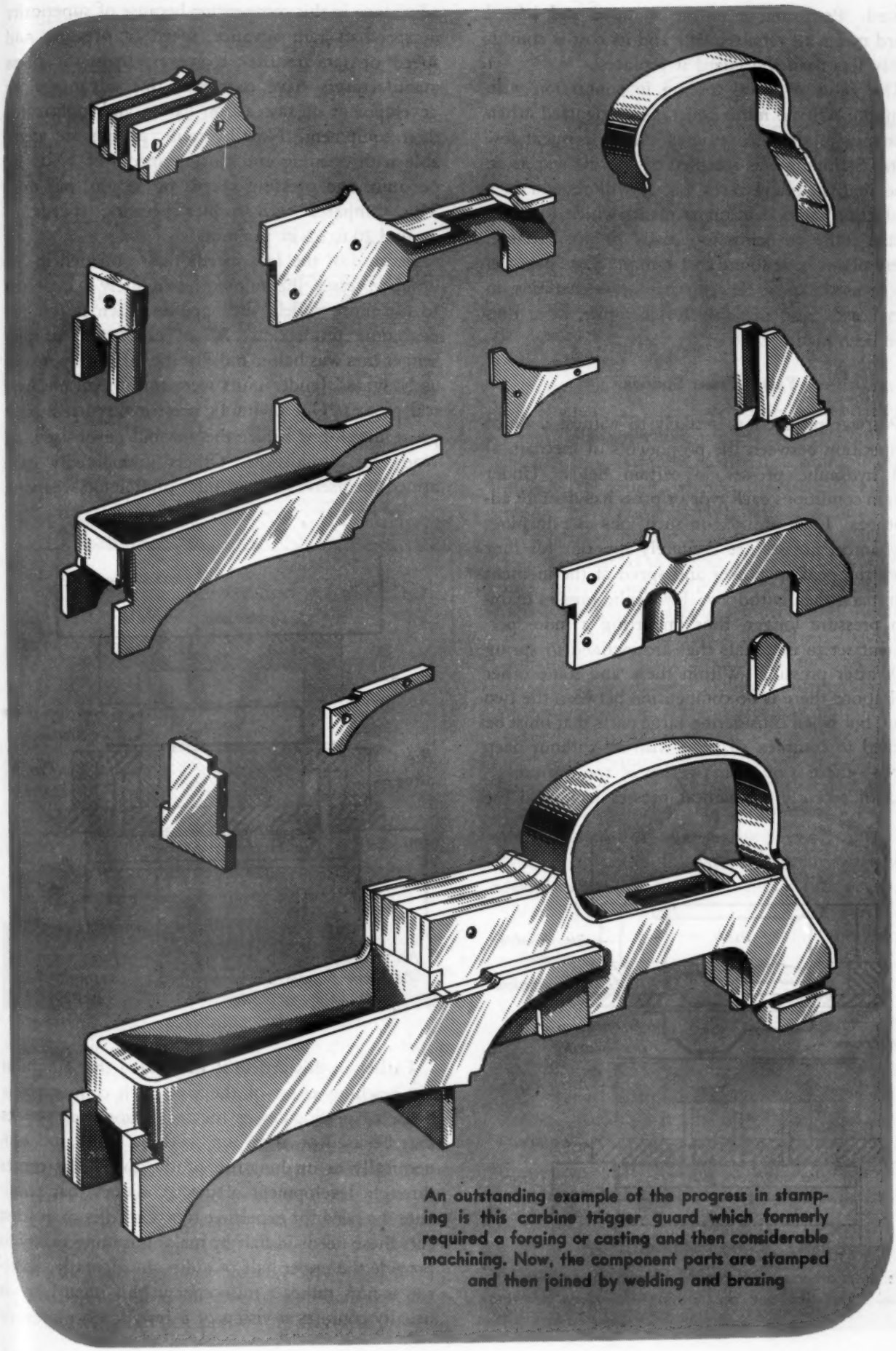
The most far reaching effect of war-born development is the realization that production requirements need not be huge to make stamping and pressing economical. Formerly it was considered necessary to have production runs of many, many thousands of pieces before even investigating the possibility of using presses. This feeling was due largely to die cost—one of the first considerations—being so great as to frighten dollar-minded individuals. Fairly complex stamped parts can be produced at a cost of from $12 to $150 for the first hundred pieces, exclusive of material cost, with huge reductions in cost on greater quantities.

Even on large quantity production items there often was reluctance to invest in expensive dies. Now industry has learned that doing the least obvious thing and investing in dies may prove to be the best and cheapest long range course. An example is cited of one part for which tooling costs were but $600.00. It was decided to produce the part by stamping. Dies and other tooling cost $15,000. However, through raising the tooling investment by this huge percentage other costs were reduced so much that at the end of a year's production a net saving of $1,500,000 had been effected.

Producers of metal stampings will enter the post-war era with this attitude: "We know that most products can be produced wholly or in part by press working. All that is necessary is that we be told the critical dimensions that are inflexible and all other capacities and characteristics required before designing has been completed." In other words, they realize and admit definite limitations as to what can and what cannot be done with presses. But they feel that if a stamping engineer could sit in on planning before designs are frozen, his suggestions would probably result in design changes that would adapt all, or at least a portion, of the product to production through presses.

Increase in Small, Precise Work

In the case of small, precision parts there has been an immense increase in production when measured by any yardstick. Wide new horizons came into view with perfection of suitable welding and brazing techniques. Numerous complex shapes were broken down into a number of simply shaped pieces that were joined through welding or brazing. Though the final shape of the assembled pieces might vary from the original design all functional requirements are met and little, if any, machining is required to attain proper tolerances. One of the best examples of this type of development is the trigger guard for the Army's new carbine. Here many pieces, quickly stamped out and joined by brazing, form a part once requiring many hours of machining and on which considerable metal was



An outstanding example of the progress in stamping is this carbine trigger guard which formerly required a forging or casting and then considerable machining. Now, the component parts are stamped and then joined by welding and brazing

wasted. Performance of the stamped and joined guard meets all requirements and its cost is considerably less than the guard it replaces.

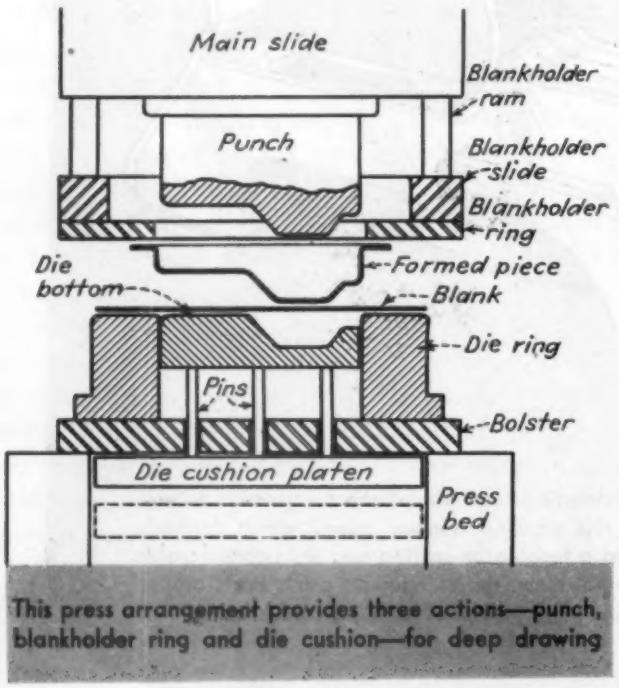
The value of good tooling in connection with stamping will be more generally recognized when consumer production resumes during the next few years. Stamping was accepted during the war as an expedient, in many cases, but it will remain as a production method in many plants which formerly passed it by as being too costly or not suitable. These plants have found that stamping and pressing can be as cheap or cheaper than other methods, in many cases, and certainly less complex after dies have been made.

Faster Press Speeds

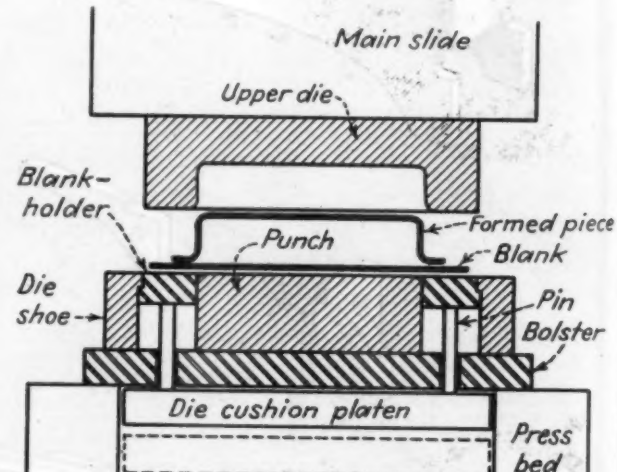
Postwar production is likely to witness a fierce competition between the proponents of mechanical and hydraulic presses in certain fields. Under certain conditions each type of press has definite advantages. For instance, on such jobs as punching, mechanical presses are definitely superior for they reach the peak of power and speed at the moment of impact, then withdraw. Hydraulic presses maintain pressure longer, thus imparting a more permanent set to materials that are inclined to spring back after pressing. Within these and some other limitations there is no competition between the two types, but when considering large parts that must be formed to complex shapes—with or without deep draws—there is quite an overlap of application.

Until recently mechanical presses have had the advantage in this competition because of superiority in speed of ram advance, speed of pressing and speed of ram return. However, hydraulic press manufacturers have narrowed this advantage by development of fast action valves and motors for their equipment. Now hydraulic presses are available with opening and closing speeds of 1,300 in. per min. and pressing speeds of 335 in. per min. This compares with former pressing speeds of around 20 to 35 in. per min.

Because of the fast speeds now provided in hydraulic presses, the automotive industry is expected to use more widely such presses when it resumes peacetime production. When production of passenger cars was halted most of the large shapes such as body and fender units were formed on mechanical presses. One hydraulic press maker has a huge press, developed before the war but never used, all ready for production. Others undoubtedly have armed themselves with similar production weapons.



This press arrangement provides three actions—punch, blankholder ring and die cushion—for deep drawing

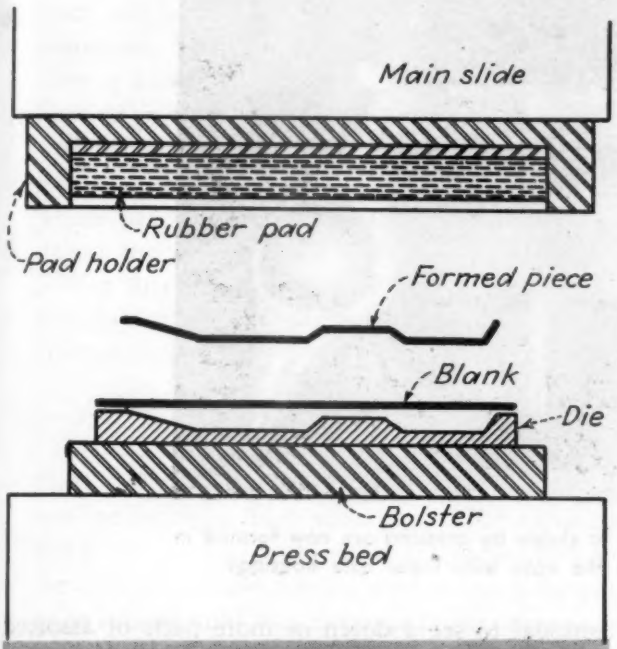


Also used for deep drawing is the arrangement in which the female die is mounted on the main slide

Earlier in this article it was stated that the most far reaching effect of the war, as it concerns this phase of production, is the realization that presses may be used on short-run work as easily and economically as on long-run production. This comes through development of die techniques that eliminate the need for expensive tool-steel dies or at least cuts these needs in half by making it unnecessary to provide the upper half of a die. Incidentally, short-run is now rather a misnomer in this regard, for it usually conjures a vision of a few dozen pieces, or

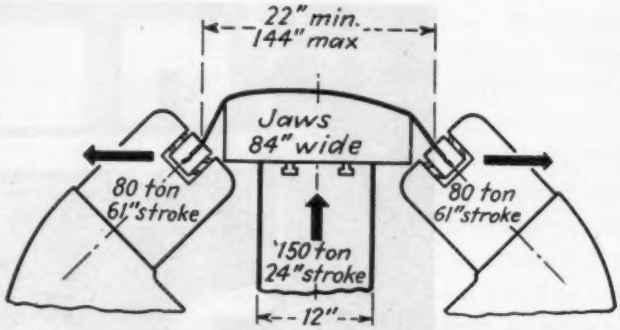
at most a few hundred. However, a short press run may now mean a production of anywhere from a half-dozen to two or three thousand pieces.

Much of this die development evolves from the discovery that many comparatively soft and easily shaped materials may be used for dies. These include zinc alloys, lead, wood, Masonite, plaster, plastics and combinations of these materials with metal, and all may be made to form many metal shapes without undue difficulty. Now comes an entirely new development which will provide low cost dies for long run production. Tool steel is now being cast to approximately final shapes of required dies so a minmum of machining remains to be done. Die halves up to 500 lb. and more are already being made this way. This advancement goes far in reducing die costs to the point where they no longer remain a serious deterrent to acceptance of press forming as a more universal production tool.



In the Guerin process, rubber pads replace the upper die to form parts faster and at much lower costs

The war saw a revived and extended use of the stretching press together with further development of the equipment itself. Stretch pressing by no means can be considered new, for it first came into use about 1915 and a very few companies continued its use to the present. However, the use of such equipment was not widespread. In view of the expected spread of application of aluminum and magnesium sheet, stretch presses are likely to have an increased importance tomorrow. Here is one more place where aircraft production fostered development. The stretching process, with its soft, easily created dies, is suited ideally to forming many skin sections of planes, where parts are either large or required in comparatively small quantities.



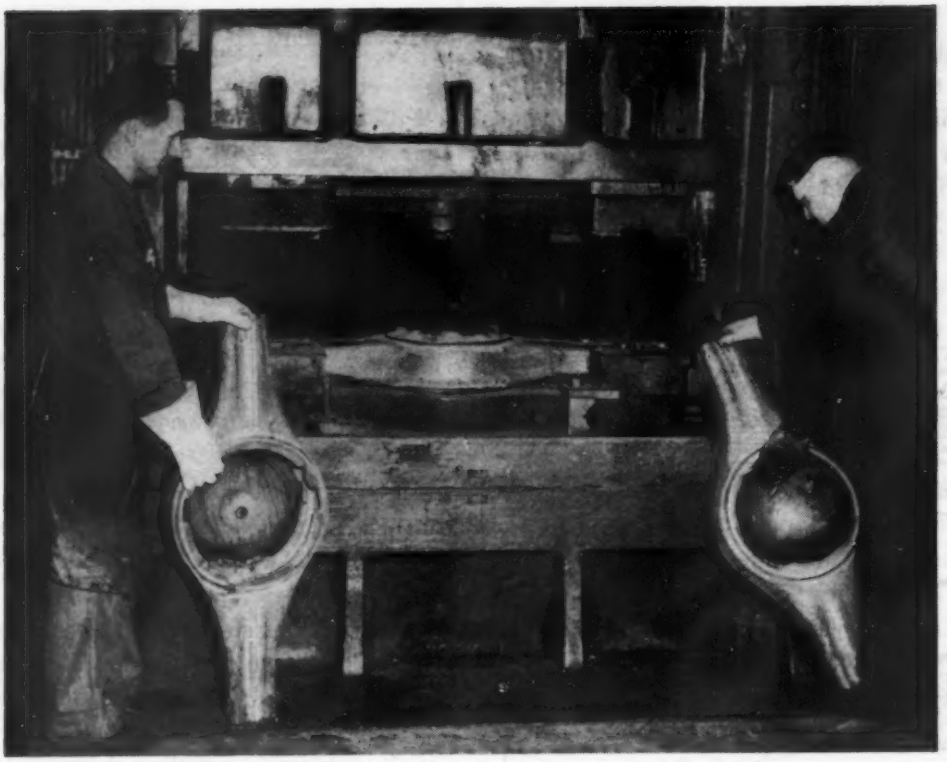
In stretching, three pressures are exerted, two pulling the metal and the third pushing the die

Where stretching is seen to have an important task, postwar, is in aiding designers and production men provide full scale models of large products. These models will serve a much more useful purpose than wooden mock-ups. Too, custom-built ambulances, funeral cars, trucks and railroad cars as well as ornamental architectural metalwork can be easily, economically and precisely built of parts so shaped. This will represent a considerable advance over hand forming operations such as are presently used for this type work. Some visionaries see many jobbing sheet-metal shops equipped with stretch presses as well as universal presses of conventional type. Emphasis will be changed from skilled sheet-metal artisans to experts in production of inexpensive dies and molds. The net result should be a material reduction in cost of custom-built transportation equipment, including railroad, aviation, marine and automotive.

Steel Deep Drawn

Although stretching requires more stock per formed part than other pressing operations, the savings in die costs and eliminating the need for huge press equipment more than offset this. Reverse draws can also be made through stretch presses when provision is made for male dies to be suspended above the stretching die.

Shortages in copper and brass, materials best suited for deep drawing of such shapes as shell cases, made industry find ways of drawing steel to the same shapes. Industry did find ways and mil-



Shapes formerly considered too complicated to shape by pressing are now formed in halves and then welded together as is the case with these axle housings

lions of steel shell cases were made. Deep drawing of steel became possible through improved drawing compounds and lubricants. Several methods were found to apply thin copper coating to steel to act as a lubricant and to prevent the steel from tearing. These will continue in use and will make possible taking advantage of the characteristics of steel in many types of products which once had to be made of copper, brass, aluminum and other materials which did not resist deep drawing. Likewise, steel products that once were made in two or more parts and then welded, soldered or brazed can now be deep drawn in one piece without seams of any kind. Special presses have been developed with high pressure blank holders that make possible these deep draws without wrinkling or other unwanted deformation of surfaces.

Production per press has been materially increased and cost per piece greatly reduced. The increased speed of pressing and the other design refinements of pressing equipment has had much to do with this. Better arrangement of presses in relationship to production lines and subsequent operations, better feeding devices and the use of full bed and tonnage capacities of presses is of equal importance.

On large presses producing aircraft parts, particularly where the Guerin process is used, it is not unusual to see a dozen or more parts of assorted shapes and sizes formed at one time. This process, developed prior to the war but brought to a high state of perfection during the emergency, involves the use of a rubber blanket to replace the die normally fastened to the upper platen of the press. Under pressure, the rubber blanket flows around the dies on the bed of the press and forces the metal to assume the desired shape. In addition to forming many parts on each trip of the press ram, actual production time of the press is raised to the limit by having reciprocating or rotating die tables, which

This copper bottle must not leak or deform under high pressures. Note the various thicknesses which must be held in the wall. Operations are as follows:

Blank	.040"
Draw	Iron out side wall to .050" thickness (except about 2" in length at open end which is left approx. .070" thick)
Wash	
Anneal	
Pickle	
1st Reduce	
Wash	Rough trim
Anneal	Wash
Pickle	Inspect
Rough Trim	Spin neck
2nd Reduce	Cut off, bore, chamfer and thread neck
Wash	Degrease
Anneal	Inspect and hydrostatic test
Pickle	

can be removed from the press. When tables are out of the presses, formed parts are removed, and blanks put into place for the next turn in the press. In the meantime a similar die table has been placed in the press and forming completed. In the case of some large presses there are four or six loading stations, so while pressing takes place on the load from one station the others are being loaded or unloaded. As can be seen, this reduces idle machine time to a bare minimum, as there is always a fresh load to be shaped.

Other types of feeds for rolls, strips, sheets and individual blanks have been in use for many years. There have been refinements in such feeds made during the war period, and there is every reason to believe that further improvements will be made to eliminate, to a high degree, waste motion of men and machines.

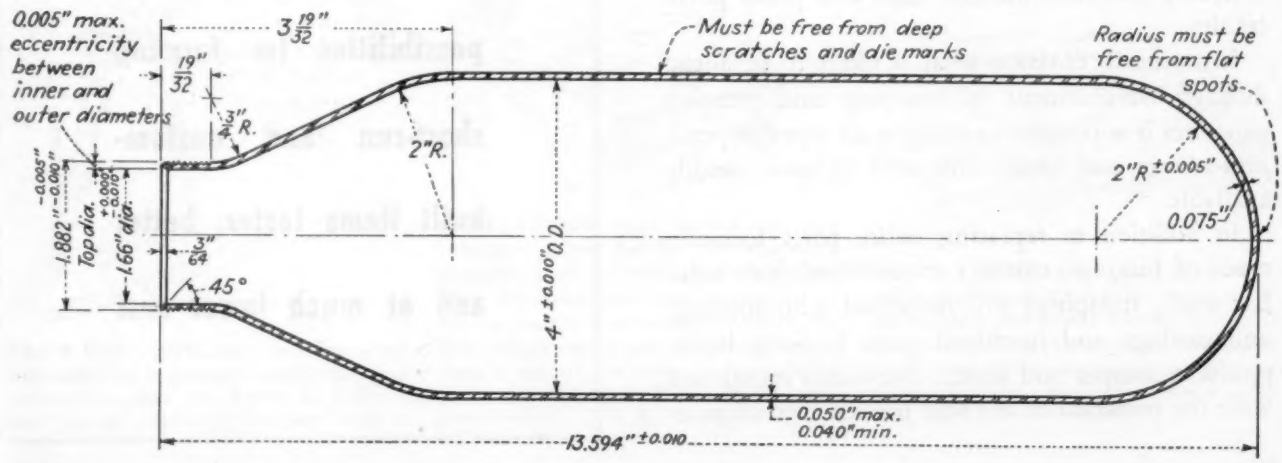
Stamping Departments Decentralized

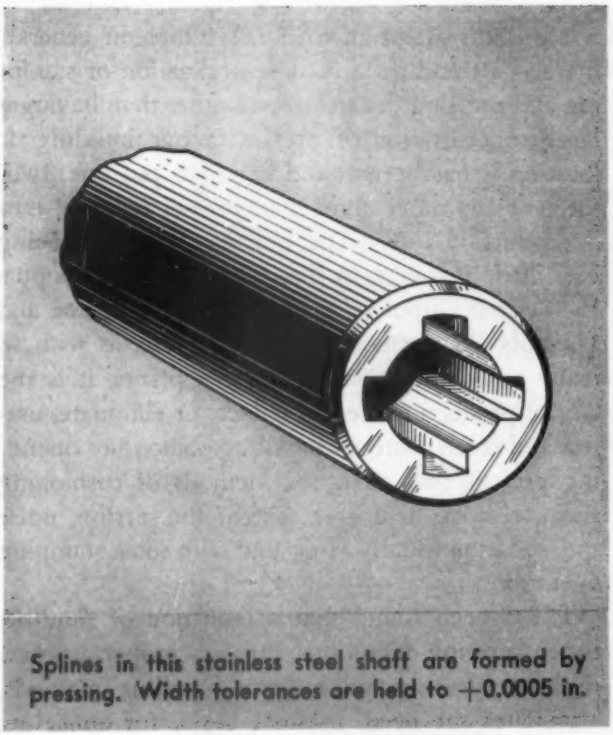
Typical of the type of development to come in feeding arrangements is one production line that was perfected a short time ago. Here, after the blank was stacked with others at the beginning of the operation, there was no need to touch the parts to be formed until they came out at the other end of the line, 750 ft. away, entirely finished. In the course of its travels through the line each part went through several drawing, washing and annealing operations. Complete synchronization moved each blank forward at the proper instant and placed it in position for the next subsequent operation. Other similar arrangements have been made. One shop has a number of presses which are mobile. When a new job comes into the shop the presses are moved about to meet its requirements in such a way that the simplest and most economical lay-out is achieved.

This calls attention to the fact that, in general, there is a trend towards decentralization of stamping and pressing departments. Rather than having a large concentration of presses in one building or location it has been found better to put one, two, three or any other number of presses required into a production line. The number of presses being governed, of course, by the required operations plus the desired output to keep the production line and assembly line properly supplied. Here, as with so many other operations in modern plants, it is the aim of production men to reduce, or eliminate, useless and costly material handling. Smoother operating presses, and advanced methods of cushioning them, remove to a great extent the jarring, noise and vibration usually associated with some stamping operations.

It has been found that a reduction of time between pressing operations, through proper arrangement of presses and modern handling methods, eliminates the need, in some cases, for annealing between pressing operations. Fast action causes the piece to retain sufficient heat from prior operations to make annealing unnecessary. This obviously speeds the whole operation still more and reduces equipment investment and results in lowered production costs.

Progress in stamping has not been limited to the actual techniques involved in production. Considerable thought is given the problems of such production long before the drawings reach the die shop or the press department. Many groups have spent a major portion of the war period, at government insistence, poring over drawings of forgings and castings to determine whether or not the parts concerned could be made satisfactorily of stamped or pressed parts. They have converted hundreds of





Splines in this stainless steel shaft are formed by pressing. Width tolerances are held to +0.0005 in.

products this way and will probably continue to do so until the day war production ends. This has given rise to a new breed of engineer—the stamping engineer—that is expected to remain as a permanent part of the production picture. This type of individual has learned much about die design, metal reactions under forming pressures, drawing lubricants and coolants and above all has developed an ability to redesign parts to take advantage of the many favorable features of stamping and pressing.

It is through the knowledge of this type of engineer that it has been possible to form large parts with inexpensive dies and have them come out to close tolerances. His position is assured in planning conferences of the future, for if given an opportunity, and there is the least possibility of doing so, he will offer suggestions that will reduce costs considerably and thus increase sales and profit possibilities.

In trying to envision what is likely to be ahead through advancement in stamping and pressing processes it is possible to imagine all types of products—large and small—that will be more readily available.

In addition to replacing entire parts formerly made of forgings, castings or machined from solid bar stock, stampings will be joined with forgings and castings and machined parts to form better products cheaper and faster. Previously mentioned were the possibilities in using pressed formed parts of special shapes for custom-built transportation equipment, but this is only part of the picture. Specially built kitchen equipment for the show-place type of restaurant as well as for model homes of the future, will undoubtedly be less expensive and easier to make through the use of pressed shapes formed with inexpensive dies. Too, a big market for special built equipment is expected in dairies, food plants and similar types of establishments where much of the equipment is built to individual specifications.

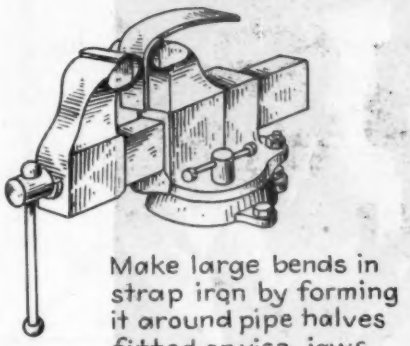
New Products Cheaply Made

Marketing of new products for consumers will be made easier when the heavy risk of investments in expensive dies can be minimized or avoided entirely and still have a few hundred or a few thousand of the products available as model or for test sales campaigns. Manufacturers would be justified in risking the loss of a few thousand dollars, if, by so investing, most of the costs resulted in finished products. This is in contrast to conditions whereby, if pressed and stamped parts were involved, die costs alone would be anywhere from several hundred to many thousands of dollars and none of the cost recoverable. Through use of newly learned tricks of pressing and stamping and inexpensive dies the former possibility is now within reach and only awaits easing of war-time restrictions on consumer production before it becomes a reality. After production is set, permanent dies can be made.

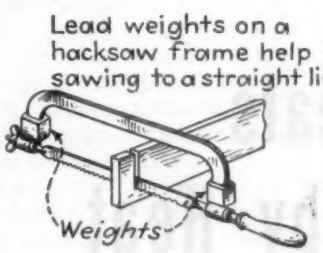
Inexpensive dies on power presses open all sorts of possibilities for forming short-run and custom-built items faster, better and at much lower cost

SHORT CUTS FOR THE SMALL SHOP

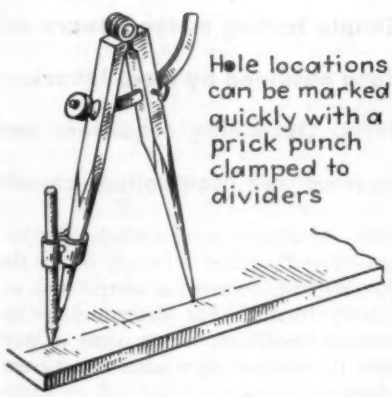
BY A. H. WAYCHOFF



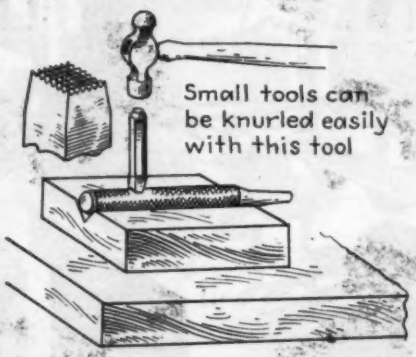
LARGE RADIUS BENDS in scrap iron can be made in a vise. Split a short length of pipe and fit the halves over the vise jaws, clamp the strap between the pipe sections, and bend the strap iron to the desired shape. Clamp the work in different positions when making smooth sweeping bends.



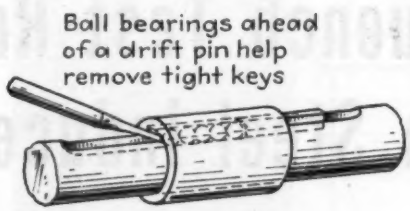
HACKSAWS will cut to a straight vertical line if ½-lb. lead or babbitt weights are attached to the saw frame as shown in the drawing. Let these weights exert all the cutting pressure. Inexperienced workers will find that this overcomes the usual tendency to twist the saw while cutting.



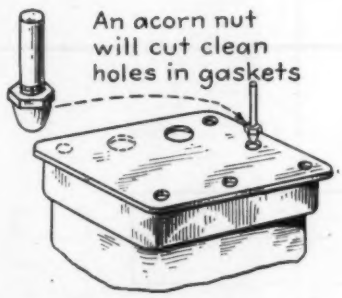
PRICK PUNCHING hole locations along a straight line is generally done after short intersecting lines are drawn to indicate hole spacing. Scribing the short lines is unnecessary when a prick punch, made from drill rod of the same diameter as a pencil, is clamped to dividers. The dividers are set to the required hole spacing, and the punch marks made directly.



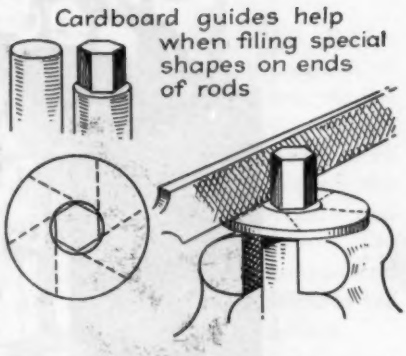
KNURLING can be done with this tool, and with practice the results approximate machine knurling. The tool is made by cutting the end off a cold chisel, leaving a ⅜-in. square face, and filing the crossed grooves before hardening.



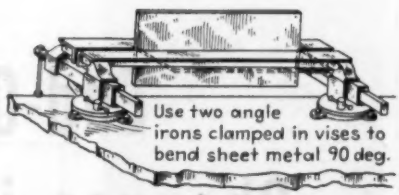
SHAFT KEYS accessible from both sides of a wheel or pulley can be removed easily by placing ball bearings in the keyway ahead of the drift pin. This is useful when the key is exceptionally tight.



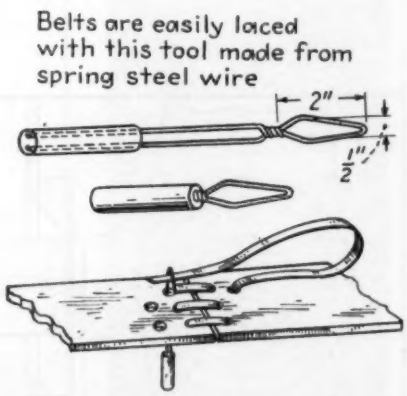
GASKETS that must be cut for bolt holes and other openings are frequently damaged when hit with a ball pein hammer. An easier and safer method is to use an acorn nut screwed on a short rod. It is self-centering and shears the gasket cleanly against the edges of the hole. A ½-in. nut can be used for gaskets with holes from 1/16 to ¾ in. diameter.



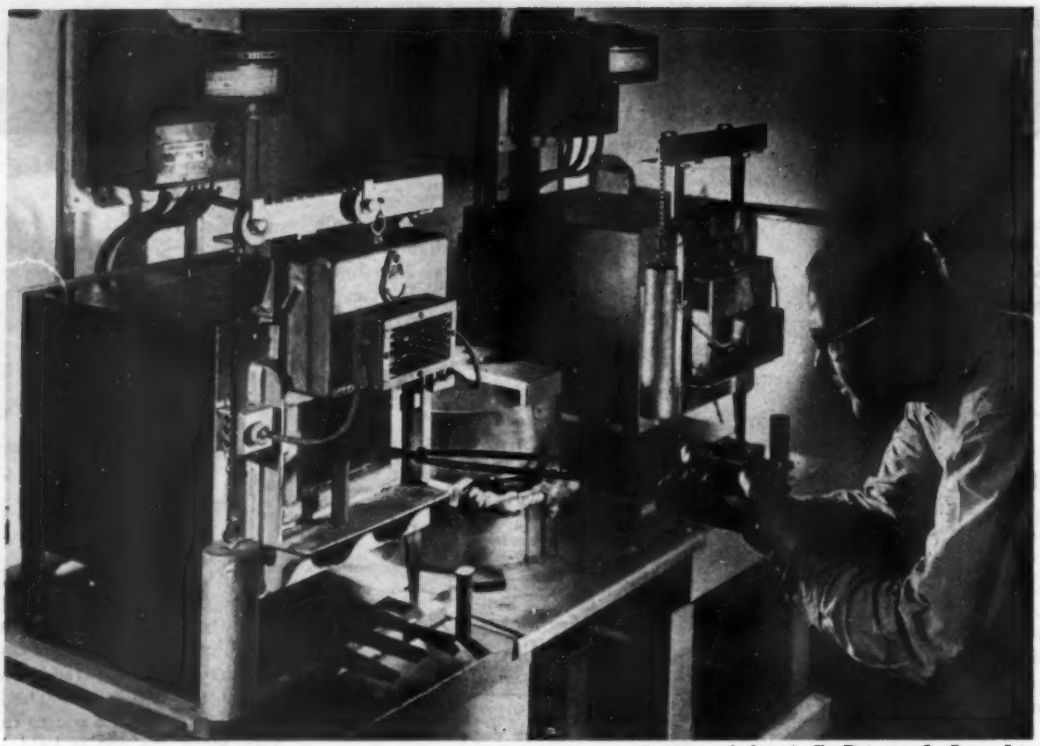
HEXAGONAL SHOULDERS on rods can be filed accurately if a guide is used. Such a guide can be made from cardboard on which the hexagonal shape is laid out and the side lines extended to the periphery of the cardboard. The guide should be a tight fit on the rod so that it will not turn when the rod is held in a vise and filed to shape indicated.



SHEET METAL angle bends are readily made by placing the stock between two structural angle irons clamped in a pair of vises. A wooden or leather mallet should be used to form the angle. Relatively heavy stock can be bent when held firmly this way.



LACING TOOLS are needed when starting leather thongs through the holes at adjacent edges of a power transmission belt. A tool made of spring steel wire and fitted with a wooden handle, as shown in the drawing, works better than a solid tool like a pin or an awl.



Courtesy of Joseph T. Ryerson & Sons, Inc.

Fig. 1—Heating and quenching equipment used in the end-quench hardenability test is shown

End-Quench Test Reveals Changes in Steel Induced by Heat

BY CHARLES M. PARKER, SECRETARY, GENERAL TECHNICAL COMMITTEE, AMERICAN IRON AND STEEL INSTITUTE

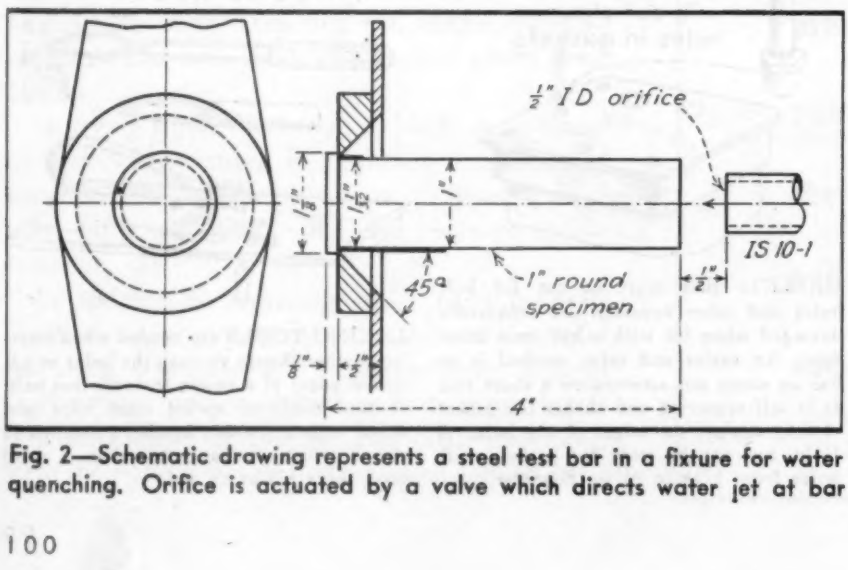


Fig. 2—Schematic drawing represents a steel test bar in a fixture for water quenching. Orifice is actuated by a valve which directs water jet at bar

Simple testing method bears out data obtained by more laborious tests. Quenching conditions and heating are controlled closely

THE STANDARD end-quench hardenability test, often referred to as the Jominy test, presents a simple but accurate method for determining the various conditions which occur in steel bars of various sizes under heat-treatment.

A previous article explained how heat-treatment changes the microstructure of steel and showed the influence of alloying elements. This article de-

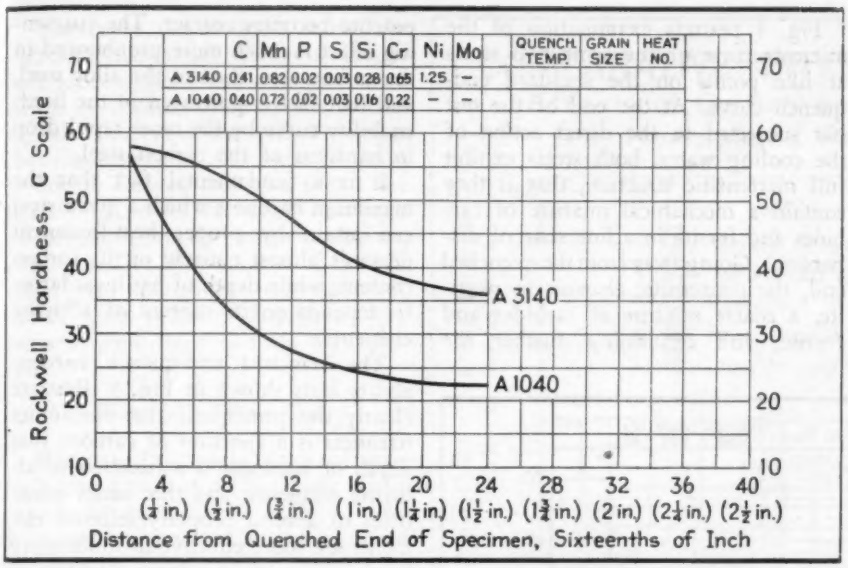

C Mn P S Si Cr Ni Mo QUENCH. TEMP. GRAIN SIZE HEAT NO.
A 3140 0.41 0.82 0.02 0.03 0.28 0.65 1.25 –
A 1040 0.40 0.72 0.02 0.03 0.16 0.22 – –
Rockwell Hardness, C Scale
A 3140
A 1040
Distance from Quenched End of Specimen, Sixteenths of Inch
(¼ in.) (½ in.) (¾ in.) (1 in.) (1¼ in.) (1½ in.) (1¾ in.) (2 in.) (2¼ in.) (2½ in.)

Fig. 3—The hardenability curves of carbon steel, A 1040, and alloy steel, A 3140, bear out the fact that alloy steel exhibits greater hardened volume. Both steels were quenched in water from the same temperature

Fig. 4—The Jominy test bar offers a comparison of the microstructures of carbon steel and alloy steel. At the end of the bars receiving direct action of the cooling water both bars are martensitic. Going up the bars, they change to pearlite and become progressively coarser. The coarsening effect is more pronounced in the carbon steel and indicates the rapid drop in its hardness

scribes the end-quench test and indicates how it can be used with other available data to predict the ordinary mechanical properties of steel.

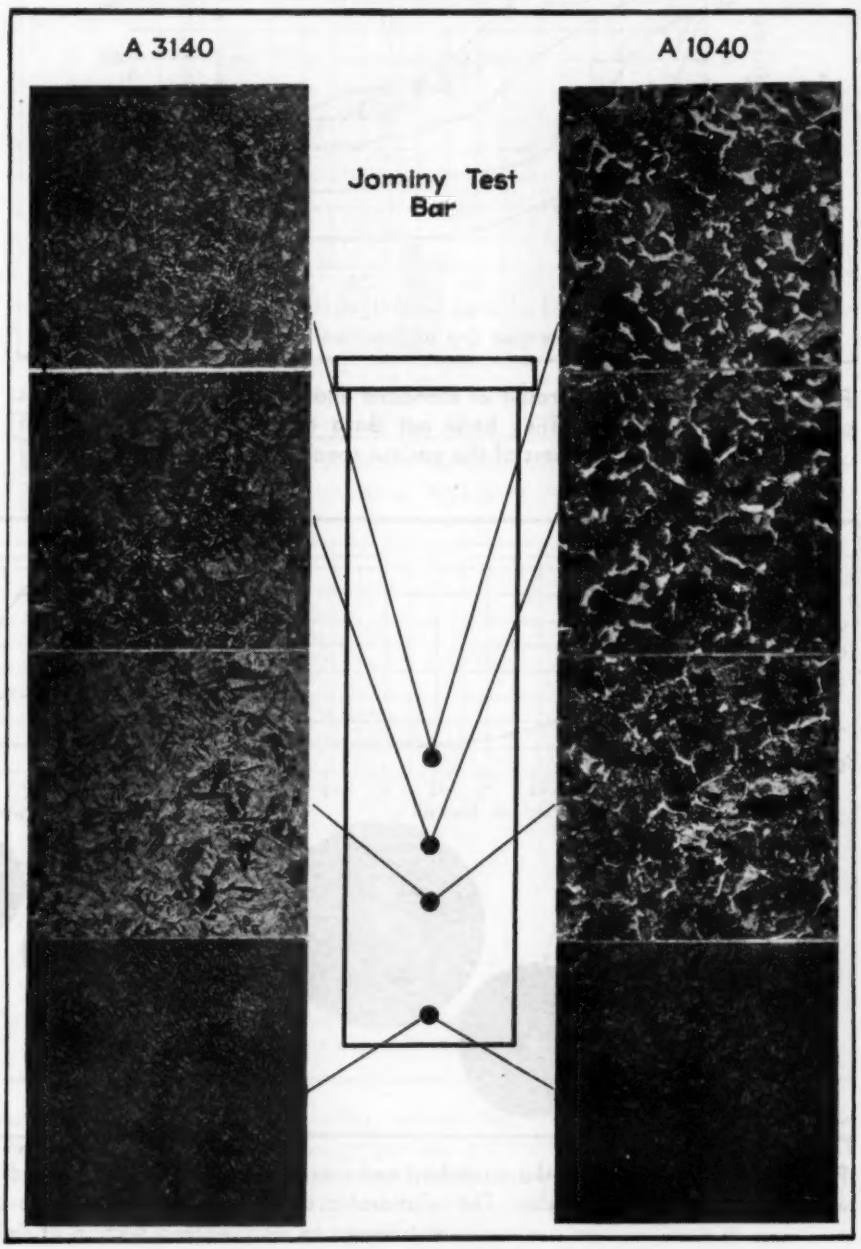
Preparation of Test Bar

The end-quench test consists of water quenching, under closely controlled conditions, one end of a one-inch diameter cylinder of steel under test. Before it is subjected to the test, the bar is machined all over to free it from decarburization and is normalized to insure comparability of results from test to test.

Care must be exercised in heating the test bar to prevent decarburization and the formation of scale. The bar is heated for 30 to 40 min. at the proper quenching temperature for the steel under test, and held at that temperature for 20 minutes.

The quenching water must be at a temperature of 75 F. ±5. The orifice, which is ½-in. in diameter and ¼-in. from the bottom face of the test specimen, is actuated by a quick-opening valve which releases a jet of water. The quenched bar is held in the water jet for 10 min., and then can be cooled by quenching entirely.

Two flats, 0.015-in. deep and 180 degrees apart, are carefully ground the full length of the test bar and Rockwell readings are taken on the centerline of the flats at 1/16-in. intervals. The data is then plotted on a standard test form which relates distance from the quenched end to the cooling rate in deg. F. per sec. at 1300 F. Because, in this test, only one cross-sectional face of the test bar is subjected to the action of the rapidly moving quenching water, various rates of cooling prevail along the length of the bar as the heat flows from the hotter to the colder areas. In effect, the test is a depth



of hardening test and its values can be and have been correlated with the cooling rates and hardness values of various sized rounds when oil or water quenched.

It will be recalled from the previous article that carbon steel, A 1040, and alloy steel, A 3140, were water quenched from 1550 F. The alloy steel exhibited greater hardened volume than the carbon steel. The hardenability curves shown in Fig. 3 accurately portray the facts.

Fig. 4 permits examination of the microstructure of the same two steels at like points on the standard end-quench curve. At the end of the test bar subjected to the direct action of the cooling water, both steels exhibit full martensitic structure, that is they contain a mechanical mixture of carbides and ferrite in a fine state of dispersion. Going away from the quenched end, the martensitic changes to pearlite, a coarse mixture of carbides and ferrite, and continuing further the pearlite becomes coarser. The coarsening effect is much more pronounced in the carbon steel than in the alloy steel, and that fact is portrayed in the hardenability curve by the more rapid drop in hardness of the carbon steel.

It is a fundamental fact that the maximum hardness which a given steel can attain by proper heat-treatment depends almost entirely on its carbon content, while depth of hardness largely depends on its content of alloying elements.

The standard end-quench hardenability tests shown in Fig. 5 illustrate clearly the principles: that maximum hardness is a function of carbon; that depth of hardness is a function of alloying elements; and that small quantities of several properly selected elements are more effective in influencing hardenability than a large quantity of a single element.

Curves Identify Steels

The curve for A 1035 is typical of a carbon steel; it identifies a shallow-hardening steel by reason of the low Rockwell values at ¼-in. and beyond. The curve for A 1330 illustrates first, the maximum hardening power of carbon uninfluenced by alloying elements and, second, the influence of an alloying element, in this case manganese, in increasing depth of hardness. The manganese content of the A 1035 was 0.78 percent, while that of the A 1330 was 1.82 percent; the carbon contents of the two steels were practically identical.

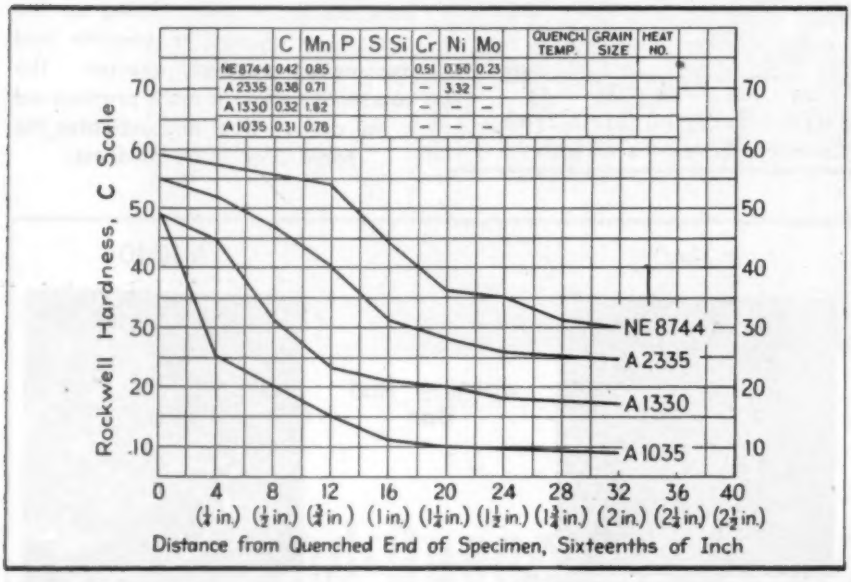

C Mn P S Si Cr Ni Mo QUENCH TEMP. GRAIN SIZE HEAT NO.
NE 8744 0.42 0.85 0.51 0.50 0.23
A 2335 0.38 0.71 – 3.32 –
A 1330 0.32 1.82 – – –
A 1035 0.31 0.78 – – –
Rockwell Hardness, C Scale
NE 8744
A 2335
A 1330
A 1035
Distance from Quenched End of Specimen, Sixteenths of Inch

Fig. 5—Curves reflect the result of standard end-quench hardenability tests on four steel specimens. They bear out data on hardness and depth of hardness of the various specimens

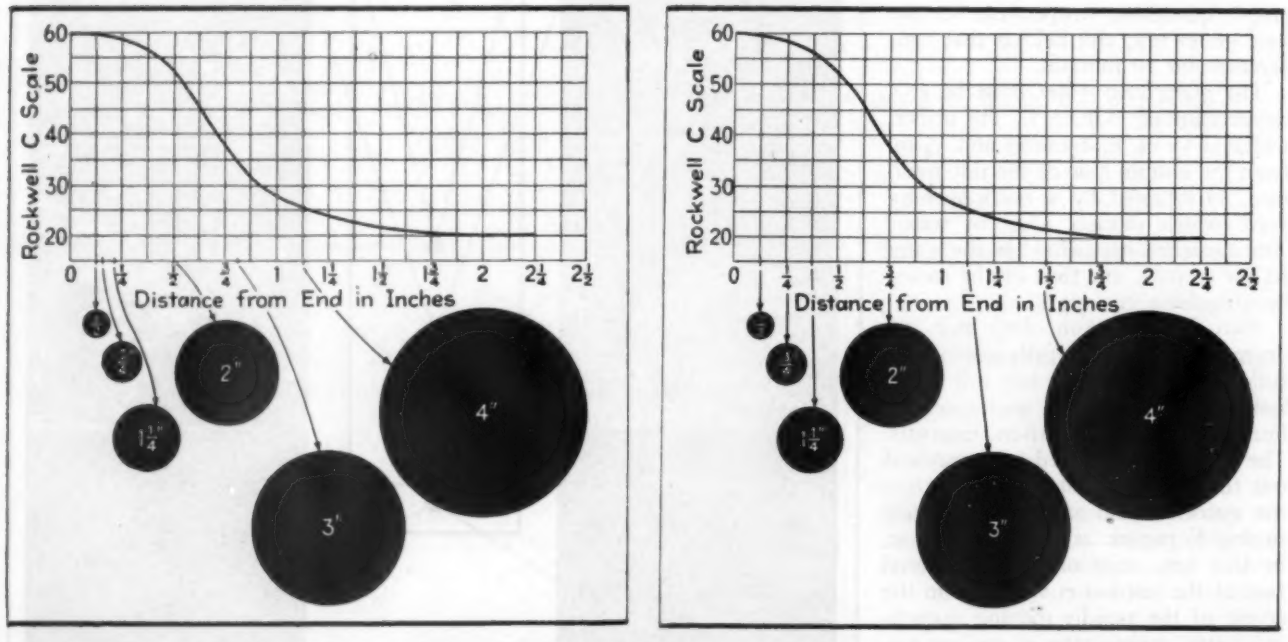


Fig. 6—The distance from the quenched end can be related to those found at the center in various sized rounds when quenched in oil or water. The relationship of the end-quench curve to size of water-quenched section is shown at left and to oil-quenched section at right

The curve for A 2335 shows the increased maximum hardness due to increased carbon and the increased depth of hardness due to 3.5 percent nickel. The curve for NE 8744 further illustrates that maximum hardness is due to carbon, and also shows the hardening power of small quantities of several properly selected alloying elements. The alloy content of the NE 8744 was manganese 0.85 percent, nickel 0.50 percent, chromium 0.51 percent, and molybdenum 0.23 percent.

Test Facts Borne Out

Mechanical property data for one-inch round bars of all the steels under discussion are offered in Fig. 7 and examination shows that the standard end-quench hardenability curves accurately portray the facts. The mass effect to be expected is also indicated by the drop in hardness values as the distance from the quenched end increases. This fact is illustrated in Fig. 8 where the actual physical property test values for various sections of NE 8744 are given.

In terms of normal expectancy, the metallurgical facts portrayed by the standard end-quench test show:

1. Maximum hardness—a function of carbon content.
2. Depth of hardness—a function of the alloy content.
3. Mass effect—a function of cooling rate.
4. Probable microstructure of steel.
5. Ordinary mechanical properties of steel.

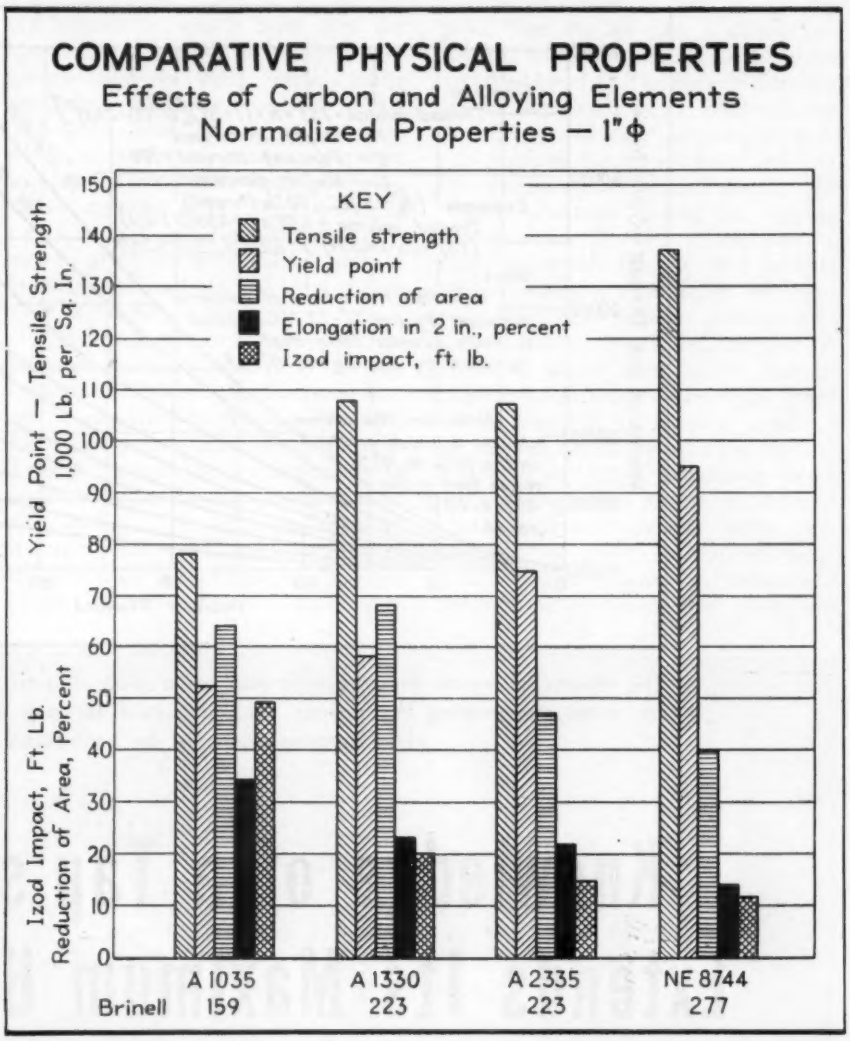


Fig. 7—Effect of alloying elements on mechanical properties are demonstrated. Data for one-inch round bars bear out the end-quench curves

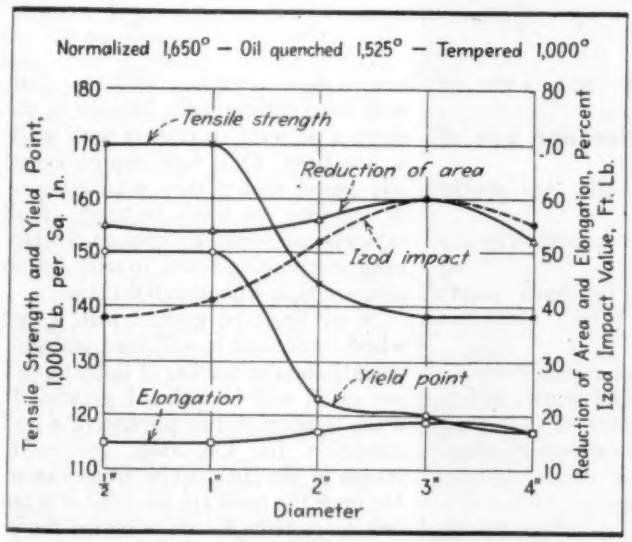


Fig. 8—Physical property test values for various sections of NE 8744 show the mass effect. The hardenability end-quench test showed the mass effect to be expected by indicating the drop in hardness values as the distance from the quenched end increases

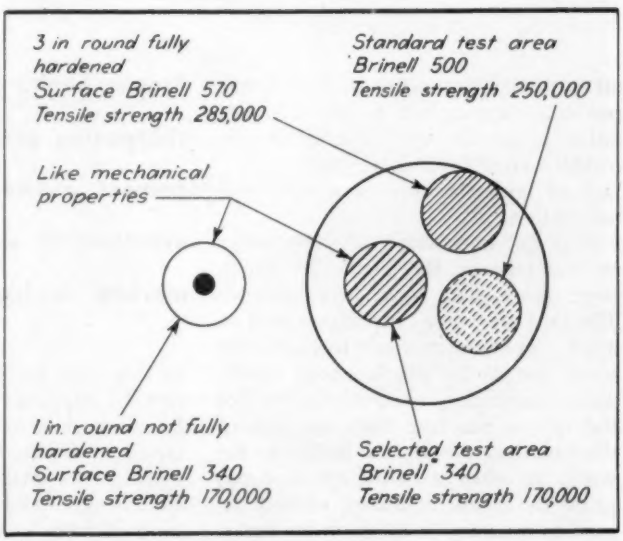
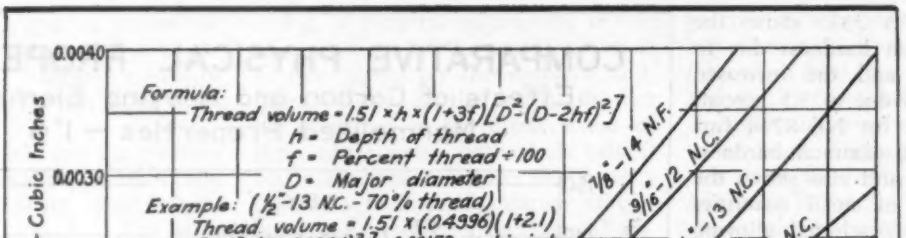


Fig. 9—The relationship between hardness and mechanical properties is shown in these test results taken from a one-inch round and from a 3-in. round of A 3140, water quenched. At equivalent hardness the tensile strength values are also equivalent



The volume of metal removed with each revolution of a tap is a controlling factor when determining the proper tapping speed for any job. Heat generated while tapping also must be considered

Knowledge of a Tap's Action Extends Its Maximum Usefulness

BY HERMAN GOLDBERG, CHIEF ENGINEER, R. G. HASKINS COMPANY

DIFFICULTIES that occur in high-speed precision tapping are usually blamed, unfairly, on the tap. Too often the troubles arise from carelessness and a lack of understanding of a tap's cutting action.

It is not uncommon in some shops to find taps on the shanks of which large screw flats have been ground. The taps are placed in holders and so much pressure exerted through the screw that the tap shank is bent. Under these conditions it is impossible for the tap to run true with the axis of the machine spindle, the holder or the work. In other cases, the operator may grind the shank freehand, without regard to accuracy or fit, in order that it can slip into a bushing. Furthermore, chucks and tap-holding devices are sometimes strained beyond their useful limits so the tap does not run true.

Many floating holders are designed to correct misalignment, but none can do this with sufficient accuracy for the type of tapping under consideration. Likewise, it is too much to expect the tap or tap holder to overcome misalignment in the machine itself. Another exceedingly poor practice is the dipping of a tap in acid to reduce its size, and thus make it cut undersize. A tap of proper tolerance will cut a hole of desired size. If it does not, the fault lies elsewhere.

Proper choice of taps, care in sharpening practice and use of correct cutting oils to avoid overloading will contribute to marked savings in tool costs

To do precision tapping it is important that the tap be kept sharp. Sharpness is more important with taps than with most cutting tools, because of the number of teeth in contact with work at one time. Dull taps require excessive power and if they are continued in use they are likely to break. Dull taps put unnecessary strain on the tapping machine and will usually cut an oversize hole with rough threads.

A tap must be ground with a fine wheel, otherwise it will load and dull quickly and the number of holes tapped per grind will be reduced greatly. If a tap is permitted to operate in a dull condition for too long, the entire length of the tap must be ground away, for once the teeth are rounded it is too late to remedy the situation by sharpening. The chamfer of a tap becomes dull, the remainder of the teeth start cutting, and the tap is soon ruined.

As the strain of removing metal is placed on the first few teeth of the chamfer of a tap, it is important that

there be proper clearance. Too great a clearance weakens the tooth back of the cutting edge. If there is not enough clearance there will be a rubbing action that causes the tap to load. Because all work done with a tap is performed at the flute, it is important that the flute be ground as smooth as commercially possible. A rough flute causes unnecessary friction, leading to the chip breaking out rather than rolling out smoothly. Scratches running the length of the tap are detrimental to high-speed tapping, as the scratches soon fill with metal, under pressure of the chip against the flute. Once this metal is built up above the surface of the tap, loading takes place rapidly and chips have a tendency to cling to the flute. When tapping deep holes this is serious, as the chips fight for room and are ground into fine metal particles.

Next in importance to finish is the amount of hook ground on the tap. This varies with the various grades of materials being tapped. Too little hook requires unnecessary power and makes it difficult to hold size. Too much hook weakens teeth of the tap at the chamfer. While it is true that an excessive hook makes the tap cut more freely, the life between grinds is shortened materially. There is no such thing as a standard hook for all grades of materials. The average stock tap has a hook of from 2 to 6 deg., and while standard taps will cut a thread regardless of the amount of hook, they do not always work efficiently and will not always produce clean threads.

Standard taps can be resharpened to obtain proper hook, so it is not necessary that different taps be purchased for each different job. Usually rechamfering and regrinding the flute to provide proper hook is sufficient for all commercial purposes. It is not difficult to change the hook of a tap, nor does it require elaborate equipment.

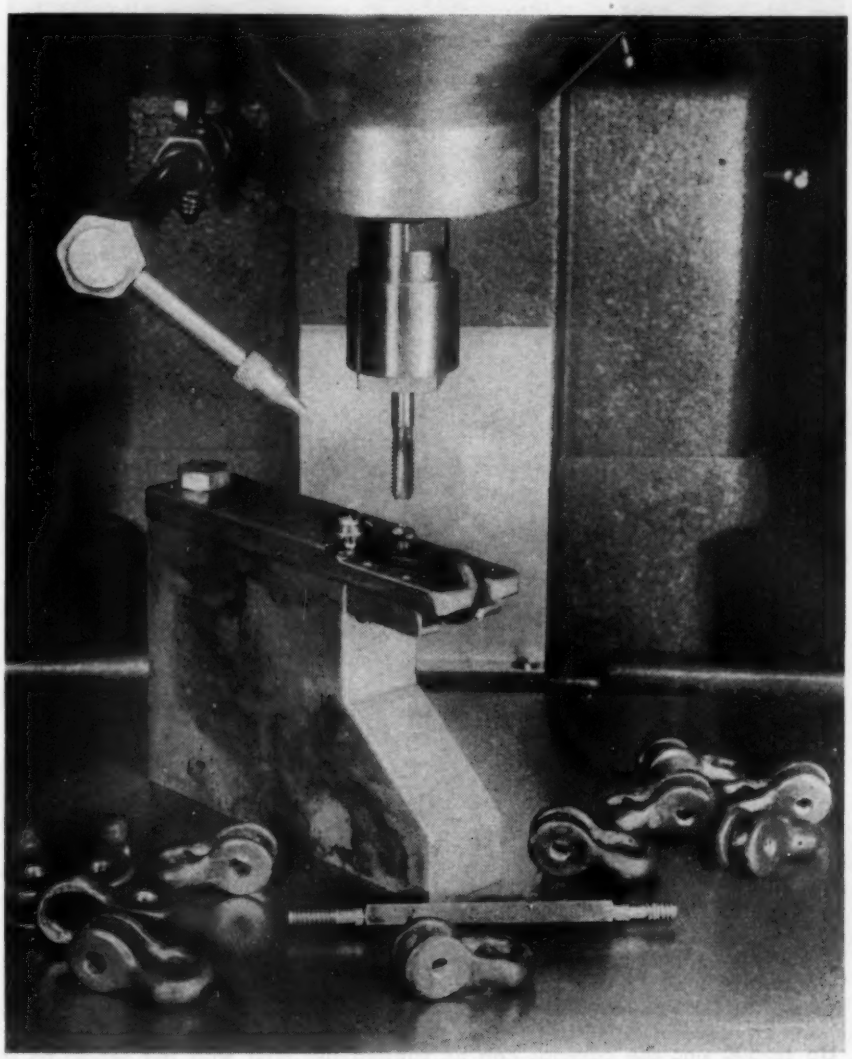
A tap's cutting action can be controlled closely through sharpening, by combining slight amount of shear with the correct amount of hook. Grinding a slight shear angle in the flute reduces the amount of power necessary for tapping. Too much shear should be avoided if tapping is close to the bottom of a hole, as the shear angle of a tap tends to push the chip ahead of the tap.

Additional cutting life can be given a tap by eliminating the small roughened surfaces that result from grinding. This is done through lapping with a pencil wheel and results in a fine, keen cutting edge. The average tap can be lapped in this manner at the rate of about 20 sec. per land. The lapping also changes the direction of grinding scratches, thus eliminating loading.

Speeds of from 15 to 35 surface feet per minute at which most taps are operated are hardly in keeping with speeds used in other metal-cutting operations. There is no reason why a high-speed steel ground thread tap, which is made of similar steel and heat-treated in the same manner, should not be operated at the same speeds as a drill or milling cutter. However, the feed of a tap is controlled by pitch of the thread and cannot be varied as with other metal-cutting tools.

It is impossible to use any set formula for calculating the speed at which a tap should operate, because feed cannot be regulated in relation to speed. An accompanying chart shows the relationship between the percent of thread depth and the volume per thread in cubic inches. It is the large difference in volume that complicates the problem of calculating the peripheral speed of a tap by set formula. A definite amount of material removal in any given time for all taps is almost impossible to determine. Tap speeds are governed by: (1) The outside diameter of the tap itself; (2) pitch of the thread; (3) the material being tapped; (4) depth of the tapped hole, and (5) the percentage of thread depth.

Heat generated during the tapping operation has a direct relationship to speed at which the tap will operate efficiently and economically. In some very deep holes heat is generated so rapidly that cutting speed must be reduced to some point below that of maximum efficiency. The same speed cannot be used for tapping a hole 1 in. deep as would be used for tapping a hole ¼ in. deep. Experience shows that tapping speed should be reduced approximately 5 percent with each doubling of depth of tapped hole. Speed is also reduced in relation to any increase in coarseness of pitch, and



This simple fixture is used for tapping up to 1,200 steel aircraft guy rod yokes per hour. The ¼ in.-20 two-flute gun tap is run at 1250 r.p.m. when tapping and at 2500 r.p.m. when reversed. The fixture permits the part to float 0.005 in. to either side to compensate for irreguarities in the SAE 2330 forgings

speed must be selected in keeping with material being cut.

Percentage depth of thread has a direct bearing on the speed at which a tap can be operated. A tap cutting a 60 percent depth of thread can be operated at a much higher speed than one cutting 80 percent or 100 percent depth of thread.

Tapping machine condition is important to high-speed tapping, for if the slides or turrets are loose, misalignment is caused when load is applied and the tap has entered the hole. Any movement after the tap has started to cut causes loading. If the tap does not run true with the spindle axis, it is likely to start cutting straight and then move at a slight angle.

To tap efficiently at high speed, the fixture must not only support the work, but also keep the work from shifting. Horizontal tapping is slower than that done vertically because chips cannot be removed as rapidly and there is danger of the chips reversing themselves with the tap, causing loading.

When all conditions are correct for efficient tapping, the life of a tap is greater at high speeds than at low, since a tap operating at its critical speed operates at maximum efficiency.

It is advisable to use double the tapping speed on tap reversals. In other words if tapping-in is at 1,000 r.p.m., it is best to tap-out at 2,000 r.p.m. This not only speeds production, but on certain grades of material it is an advantage to get the tap out of the work as quickly as possible. If a tap stays in a material that shrinks rapidly there is a rubbing action on the reversal of the tap that causes loading. This increased speed is only advisable if the machine spindle is rigid, otherwise the tap may cut backwards and be ruined.

When working with materials such as heat-treated nickel steel alloys, in which there is a combination of hardness and toughness, it is often best to tap in two operations. This is especially true of coarser pitches and small taps, because of the physical limitations of the tap. Tap teeth must be strong enough to remove the hard, tough metal without breaking. To do this, width of land must be so great that there is not sufficient chip room in flutes of the tap. Increasing the hook for tough materials will make the tap cut easier, but its life is shortened considerably. While such a tap dulls slowly, the teeth usually break or chip out of the chamfer. Cost of tapping in two operations will be less, in these cases, than in one operation, because of savings effected in reduced tap breakage and less spoiled work.

Tapping close to the bottom of the drilled hole in one operation is usually difficult as there is not sufficient chip room. If there is not enough chip room in the hole or in flutes of the tap, or both, it is best to tap in two operations. A tap that is sufficiently undersized should be used for the first operation, so the second tap can do its share of the work.

Some mechanics, tapping in two operations, run a tap as far as possible and then use the same size tap for the balance of the hole. Often a chamfer tap will be used first and then a bottoming tap for the second operation. These two methods do not lend themselves to high-speed tapping to close tolerances. It is better to use a special undersize tap for roughing and a standard tap for the second operation. To do this correctly, the first tap should be undersized an amount equal to that shown in the accompanying table. This gives the finishing tap a chance to cut metal instead of merely rubbing the previously cut thread. It also gives the finishing tap a chance to correct any errors left by the roughing tap. It is important that the first operation be just as accurate as the second tapping.

There is a limit to the depth that any tap will enter a blind hole. This depends upon the outside diameter, pitch of the tap, depth of drilled hole, and percentage of depth of thread. There must be sufficient room to take care of chips without crowding, otherwise they will be ground up and pack into flutes of the tap. This will either result in loading the tap or packing the chips so tightly that the tap breaks. Often jobs that require two operations could be tapped in one operation if drilled holes were deeper.

Many blind holes that are tapped

Up to 500 zinc die castings can be tapped per hour with this set-up on a pedal-controlled tapping machine. The fixture has a simple index base with vertical arms to support the casting. The base has three slots so the base can be turned to locate against a stud for tapping each of the three holes in turn. No clamps are required

successfully with fine pitch taps will be troublesome if coarser taps are used. This is due to the extra amount of material removed for the same outside diameter of tap. Likewise, a deeper hole can be tapped when cutting only 50 percent depth of thread than when cutting 80 percent depth of thread. This is due to volume of metal removed. Less metal is removed with a 28-pitch than with a 20-pitch tap.

There is no set rule as to when it is best to tap in one or two operations. A simple solution is to watch the tap in operation. If there is any resistance to its free-cutting action, there is bound to be tap trouble and it is best to tap in two operations.

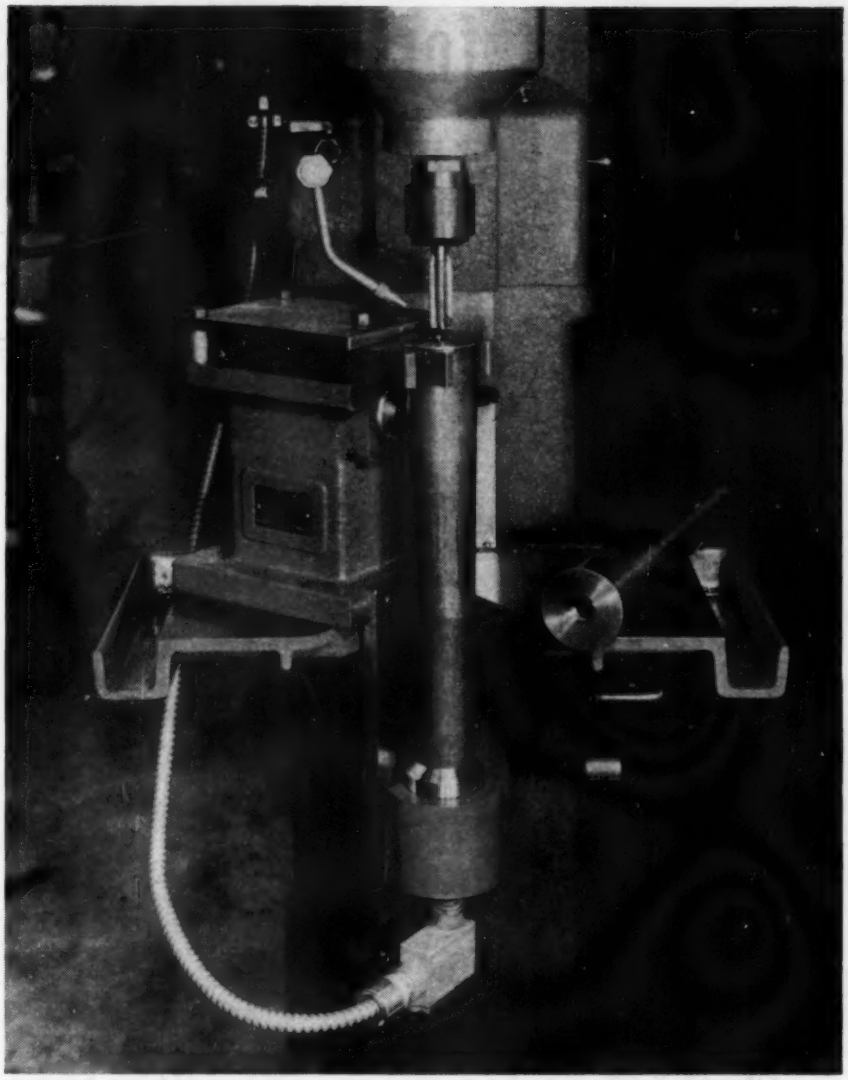
When tapping blind holes in two operations it is important that the first tap cuts at least one-half to one thread deeper than the second tap, so that the finishing tap need not be required to remove a great amount of metal when it reaches the bottom of the hole. It is also important that the finishing tap should have a shorter chamfer than the roughing tap. It is best to confine the cutting action on a few teeth for finishing, as it is easier to maintain size and resharpen the tap.

Cutting fluid is one of the most important factors in successful tapping. The greatest single problem in selecting an oil for tapping is to find one that will eliminate tap loading. Many cutting oils fail because they do not keep the work cool enough. Lard oil is a poor tapping fluid where any speed is concerned and soluble oil has little merit, for while it is excellent as a coolant its use results in rapid tap loading. A proper tapping oil must combine a load-carrying capacity with cooling qualities which keep temperature of the tap and work as low as practical. It must be of sufficiently thin body to be suitable for tapping at high speeds.

Most oils will not give consistently uniform results at both high and low speeds. Some oils will load the tap in the angle of the thread while others will cause the tap to load at the cutting edge in the flutes. In either case, tap life is short. Many cutting oils work satisfactorily for a short time and then lose their life. The longer the oil is used, the poorer the quality of threads.

It is safe to say that industry, in general, obtains less than 10 percent of the useful life of the average tap. Rarely do taps wear out in actual service, as do other cutting tools. Taps are usually broken. With proper cutting lubricants, this waste of tap life can be reduced materially, if not eliminated.

The next article in this series will appear in an early number.



Primer holes are tapped in 12-in. long cartridge cases in this set-up. The special air vise is controlled by a small electric switch actuated when the lower centering plug is pressed down after the piece has been pressed forward into the vise jaws. These jaws open automatically after the tap is withdrawn from the work. Up to 700 cases have been tapped in an hour

AMOUNT TO REDUCE DIAMETER OF FIRST TAP WHEN TAPPING IN TWO OPERATIONS

Pitch (Thds. Per Inch)	Amount to be Deducted From Tap Diameter	Pitch (Thds. Per Inch)	Amount to be Deducted From Tap Diameter	Pitch (Thds. Per Inch)	Amount to be Deducted From Tap Diameter
10	0.0324	20	0.0162	40	0.0081
11	0.0295	22	0.0147	44	0.0073
12	0.0270	24	0.0135	48	0.0067
13	0.0249	27	0.0120	50	0.0064
14	0.0231	28	0.0115	56	0.0057
16	0.0202	30	0.0108	64	0.0050
18	0.0180	32	0.0101	72	0.0045
19	0.0170	34	0.0095	80	0.0040
		36	0.0090		

Set-Ups for Increasing Production With Formed or Multiple Wheels

BY A. LAMBERT OLLER, ENGINEER, LANDIS TOOL COMPANY

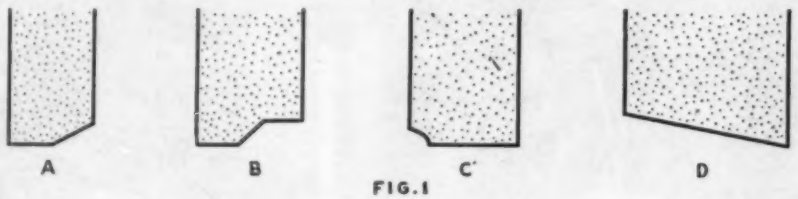


FIG. 1

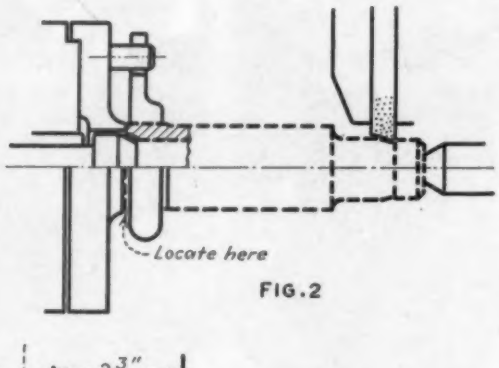


FIG. 2

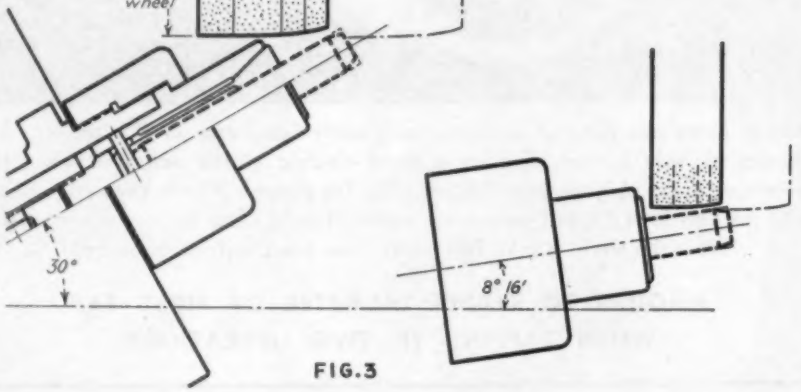


FIG. 3

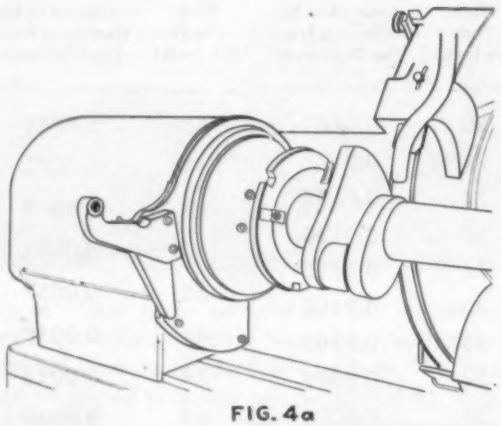


FIG. 4a

FIG. 4b

It pays to study any plunge-cut grinding operation to see whether it can be done quicker with a formed wheel, or by mounting several wheels on the spindle. Very often seeming bottlenecks in production are easily solved by one of the setups illustrated. They will be obvious to many people in charge of grinding operations, but on the other hand they are not as generally applied as they might be.

Formed-Wheel Grinding

With modern truing devices, complicated outlines or contours can be produced on wheel faces, thus reducing the number of operations and setups, and making it possible in many cases to grind parts that could not be otherwise handled economically.

Fig. 1—The wheel face at *A* is trued to grind a straight diameter and an adjoining taper in one operation, instead of two. Without a formed-wheel, the complicated shape shown at *B* could not be produced economically. By truing a wheel as at *C*, the outside diameter and an undercut are ground on an airplane engine valve. Eight diameters are produced on a control rod with an 11-in. wheel trued as at *D*. Adjacent tapers are so alike that the illustration does not show them. Formerly each taper was ground separately, and production was far behind schedule. The wheel is trued with a profile truing device equipped with a profile truing bar

Fig. 2—The wheel face is trued with a profile bar so that the various radii, the taper, and a straight diameter are blended

Fig. 3—Left, the workhead is set at 30 deg. for grinding a chamfer on one end of a valve tappet. The wide-face wheel is trued to a profile on the right-hand side, to rough the grind the chamfer from the solid. Left-hand side of the wheel face is straight to finish

the chamfer. Right, to grind the 8 deg. 16 min. chamfer at the other end of the piece, the work-head is positioned as shown, and a narrow wheel contoured in the same way is used. Profiles change at the vertical lines sketched on the wheels

Fig. 4—Time is saved in grinding a crankshaft counterweight and balancing the shaft by using a wheel with two beveled edges. Straight part of the wheel face grinds the counterweight, the bevels remove stock for balancing

Multiple-Wheel Set-Ups

Although the part shown in Fig. 5 was ground with a single formed wheel, most grinding engineers feel that such complicated shapes are best done with multiple wheels, and usually in more than one operation because of the difficulty of maintaining size on all diameters at once.

The objection to multiple wheels is that one may be grinding metal and another may not clean up the work properly. If many wheels, or several wide ones are used, it may be necessary to use a special grinder designed so that the wheels can be mounted between the spindle bearings. This construction secures rigidity, despite the great wheel weight and pressure.

Fig. 6—Eighteen wheels are mounted on one spindle to grind recesses between cams and main bearings of a cast camshaft. Thus, one infeed and withdrawal complete the operation, instead of 18, as would be the case with an ordinary machine. To save time in truing the wheels, a hydraulically operated slide mounts four diamonds, trues all wheels in one traverse. Each diamond trues not more than five wheels

Fig. 7—Two straight-face wheels grind two diameters simultaneously as at *A*. In the next operation, *B*, a single wide wheel (spanning the groove) grinds two 0.276 in. diameters

Fig. 8—Two formed wheels are employed to grind two chamfers. In the first part of the operation, the wide wheel grinds a straight diameter and an adjoining chamfer, but the narrow wheel is idle. Then the work is shifted so that the narrow wheel grinds the chamfer at the left while the wide wheel is idle

Wheels Set at An Angle

When both a diameter and an adjoining face must be ground (with square or filleted corner), production with the wheel set at angle may be as

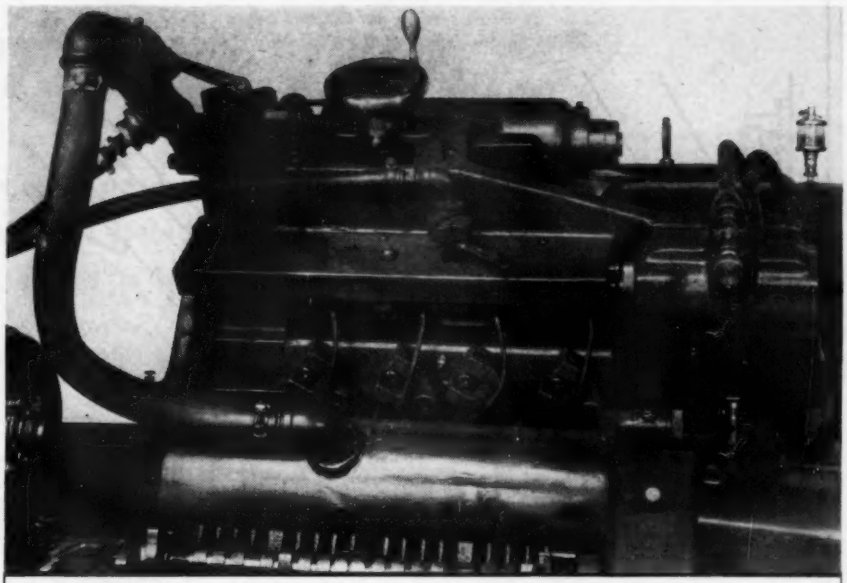


FIG. 6

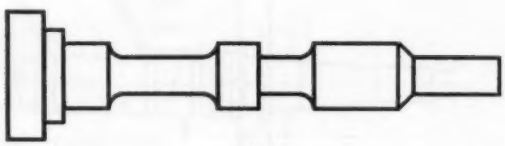
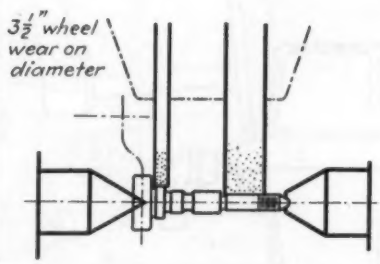
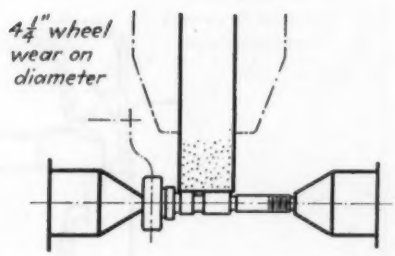


FIG.5



Operation No. 1
Grinding 0.378" dia. and 0.166" dia.
Using double wheels

FIG.7a



Operation No. 2
Grinding 0.276" dia.
Single wheel

FIG.7b

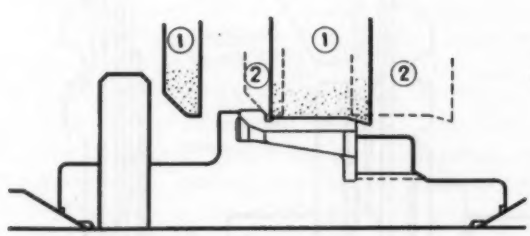


FIG.8

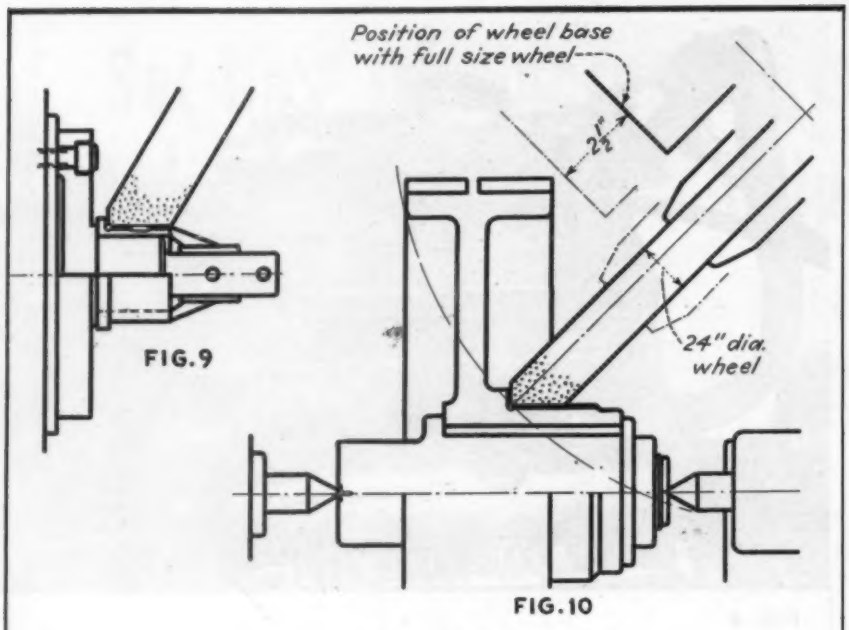


FIG.9

FIG.10

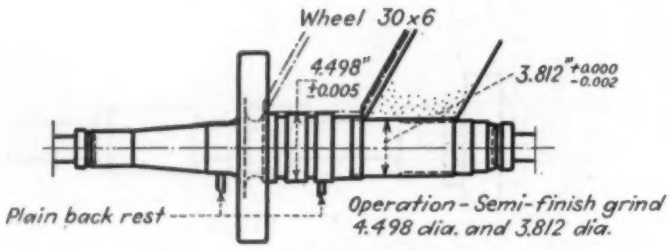


FIG.11

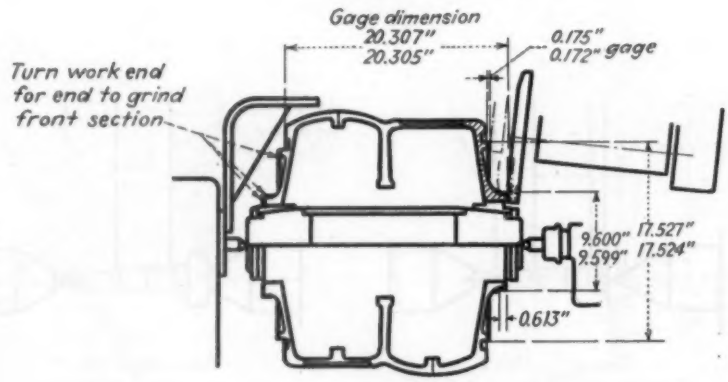


FIG.12

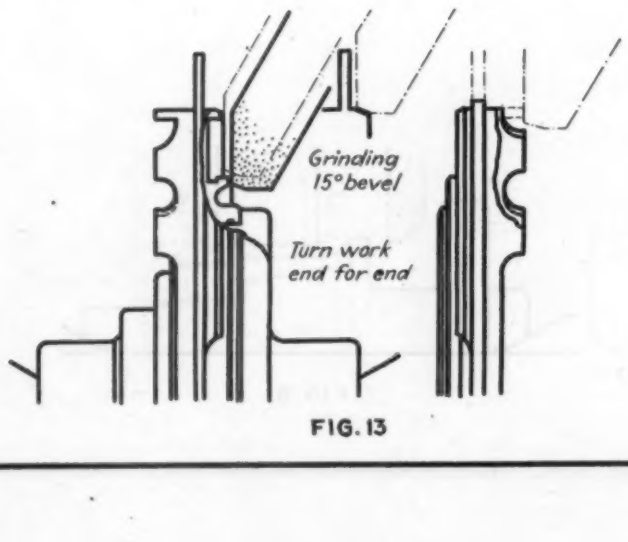


FIG.13

much as 15 times greater than with straight-wheel grinding. In the latter type of operation, two methods are available for wheel feeds: (1) straight, with the side of the wheel first contacting the shoulder and finally the face contacting the diameter, and (2) contact the diameter away from the shoulder and traverse the wheel until it touches the shoulder. Both methods produce excessive pressure against the side of the wheel, and the first method causes the edge to break down after a few cuts, producing an imperfect corner. Also grinding with the side of the wheel results in larger area of contact. Greater pressure and a harder wheel are then required.

Best results are obtained in angle grinding by setting the wheel at either 30 or 4 deg. and truing the wheel face to suit. Most plain grinders for 30-deg. grinding are single-purpose machines because the head is permanently set at that angle. The 4-deg. machines may have the wheelhead positioned either at 4 deg. or to do straight cylindrical grinding. With a universal grinder, of course, the wheelhead can be set to any angle. Softer wheels, which cut faster, can be used when set at an angle.

Fig. 9—As compared to the straight in-feed method, production was increased ten-fold, and burning the work was eliminated by setting the wheel at 30 deg. Wheel marks on the shoulder were practically eliminated

Fig. 10—A projection on the work, in this case a rim, makes it mandatory to set the wheel at an angle, but the practice is also advantageous where there is no obstruction because burning the shoulder is eliminated and the finish is improved

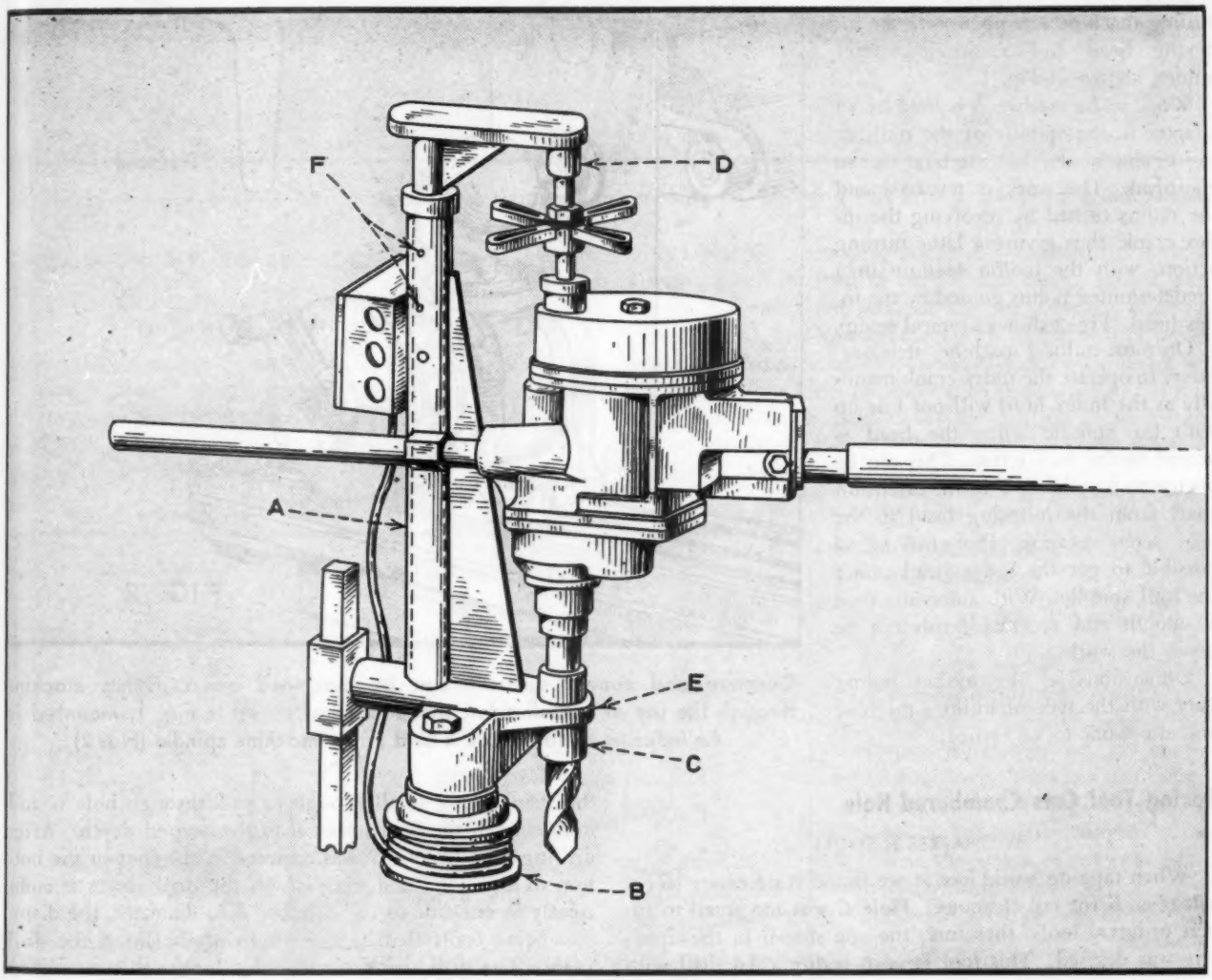
Fig. 11—Two diameters can be ground with the same wheel set at an angle. Here, the wheel first grinds the 3.812 in. diameter and adjoining shoulder, is then moved to the 4.498 in. diameter under the projection

Fig. 12—A formed wheel, set at a 4-deg. angle, grinds two faces and a diameter with adjoining radius. To accomplish this, the wheel is set in three positions. When one end of the workpiece is ground, it is reversed in the centers and three similar surfaces are ground on the opposite end

Fig. 13—A formed wheel, set at a 30-deg. angle, grinds two faces and a chamfer in three operations. In the second set-up, the part is turned end for end and the same wheel grinds three faces

Practical Ideas

War-Winning Suggestions appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to war production



A pneumatic motor can be set up quickly for drilling steel plate by supporting the motor in this frame, the legs of which are wound with magnet coils energized by 70-volt d.c. current

Magnetic Frame Supports Drill Motor

BY ROBERT JOHNSON
Kaiser Company, Incorporated

The drawing shows a magnetic device for supporting and aligning motors when drilling holes in steel plates and structural members, which formerly required the use of an "old man." This device, which weighs 18 lb., consists of frame *A* supported on three legs with magnet coils *B* wound around two of the legs. A switch closes a 70-volt d.c. current, energizing the coils and affixing the frame to the steel plates. The motor is held in the frame by bushing *C* around the drill and bracket *D* which takes the thrust while drilling. Bushing *C* is threaded in bracket *E* and can be adjusted to control the depth of the drill hole and to prevent the drill from falling from the frame. The size of bushing can be varied, depending upon the diameter of drills required. After drilling is completed, the fixture is loosened for moving by switching off the current.

Frame *A* is adjustable for height since the top part of the frame is designed to telescope in the base. The top part is held at the desired height by pins inserted in holes *F*. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Turning a Sphere On a Milling Machine

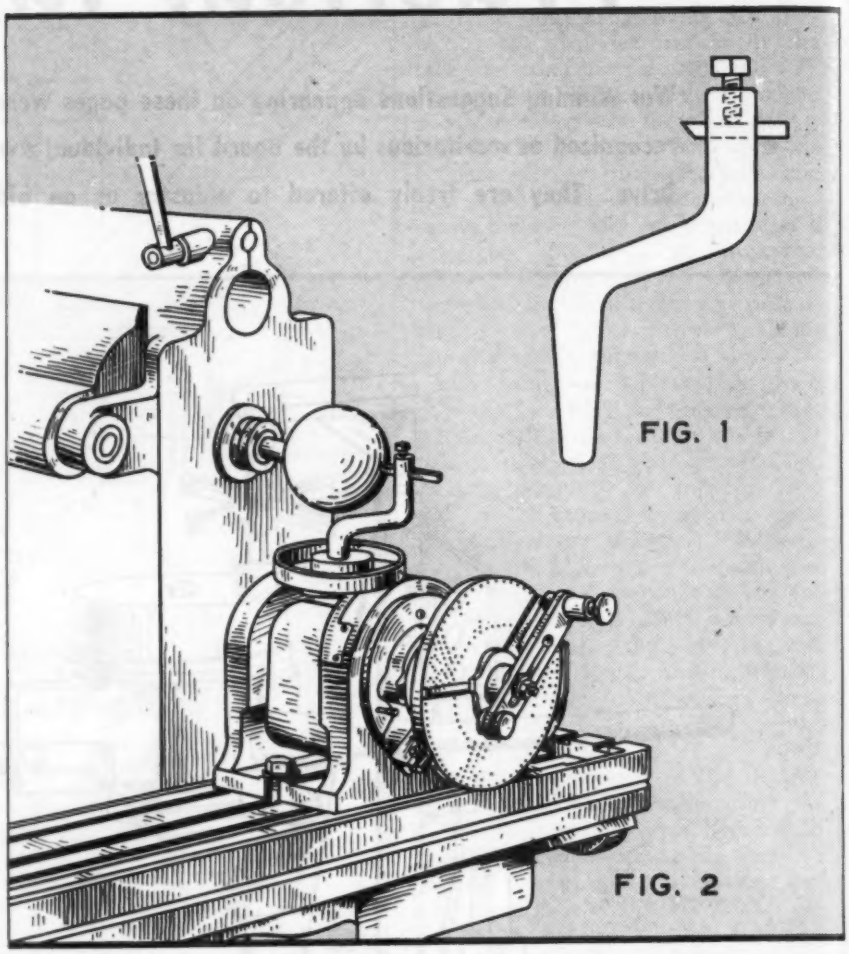
BY ROBERT BELL

Normally to machine a concave or convex surface, such as a ball and socket joint, a specially equipped lathe is necessary. However, the work can be accomplished, easily, on a horizontal milling machine equipped with an indexing head and a simple toolbit holder, shown in Fig. 1.

Work to be machined is held by an adapter in the spindle of the mill, or in a chuck if the machine is so equipped. The work is revolved and the radius turned by revolving the index crank, thus giving a lathe turning action, with the toolbit feeding in a predetermined radius guided by the index head. Fig. 2 shows a typical set-up.

On most milling machines it is necessary to operate the index crank manually as the index head will not line up with the spindle when the head is geared to the lead screw. This can be overcome by adding a 12-in. extension shaft from the indexing head to the lead screw gearing, thus making it possible to get the index head under the mill spindle. With automatic feed a smooth and accurate finish can be given the work.

Dimensions of the toolbit holder vary with the type of milling machine and the work to be turned.



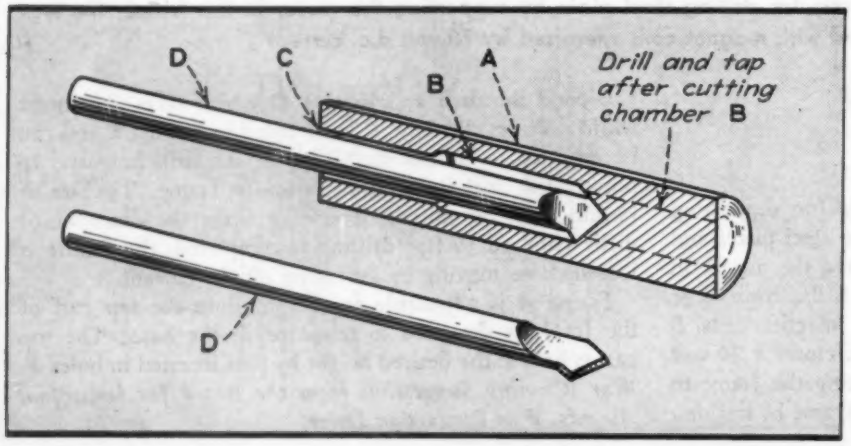
Concave and convex surfaces can be machined on a milling machine through the use of a toolholder, similar to that shown in Fig. 1, mounted in An indexing head. Work is held in the machine spindle (Fig. 2)

Spring Tool Cuts Chambered Hole

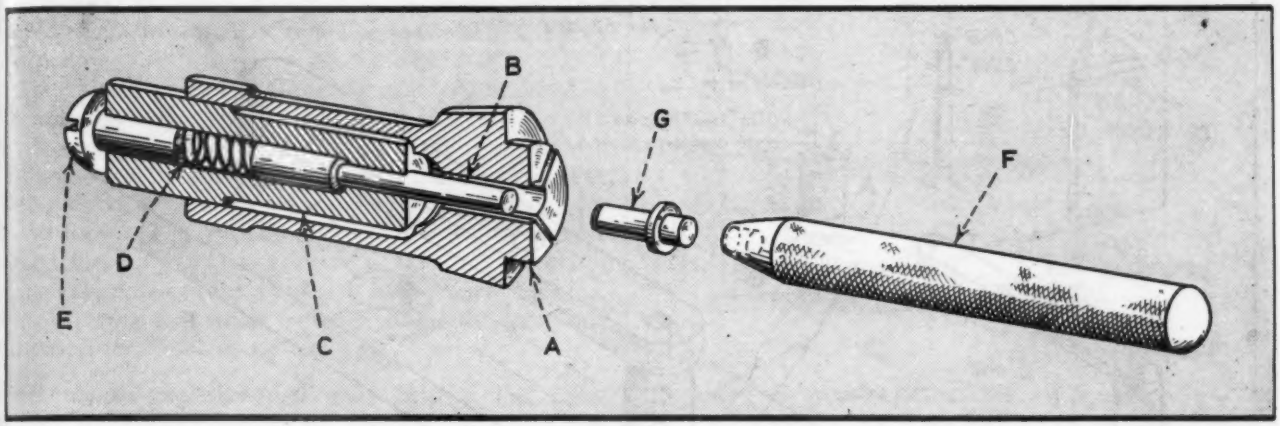
BY CHARLES F. SMITH

When tapping workpiece *A* we found it necessary to cut chamber *B* for tap clearance. Hole *C* was too small to insert ordinary tools; therefore, the one shown in the drawing was devised. This tool *D* is in reality a flat drill with the shank being small enough to pass through hole *C* and long enough to cut chamber *B* to the desired depth. After drilling hole *C*, tool *D* was centered in the cone at the bottom of the hole, and pressure on the drill forces it sufficiently to one side to cut chamber *B* to diameter, the diameter being controlled by the length of the lip at the drill point. The drill shank is somewhat longer than would be used ordinarily.

This job was done on a screw machine. After chamber *B* was machined to diameter, a hole was drilled at the right-hand end of the work piece and tapped with left-hand threads. Hole *C* was tapped with right-hand threads.



A flat drill which springs to one side under cutting pressure was used to chamber the hole at the center of this workpiece



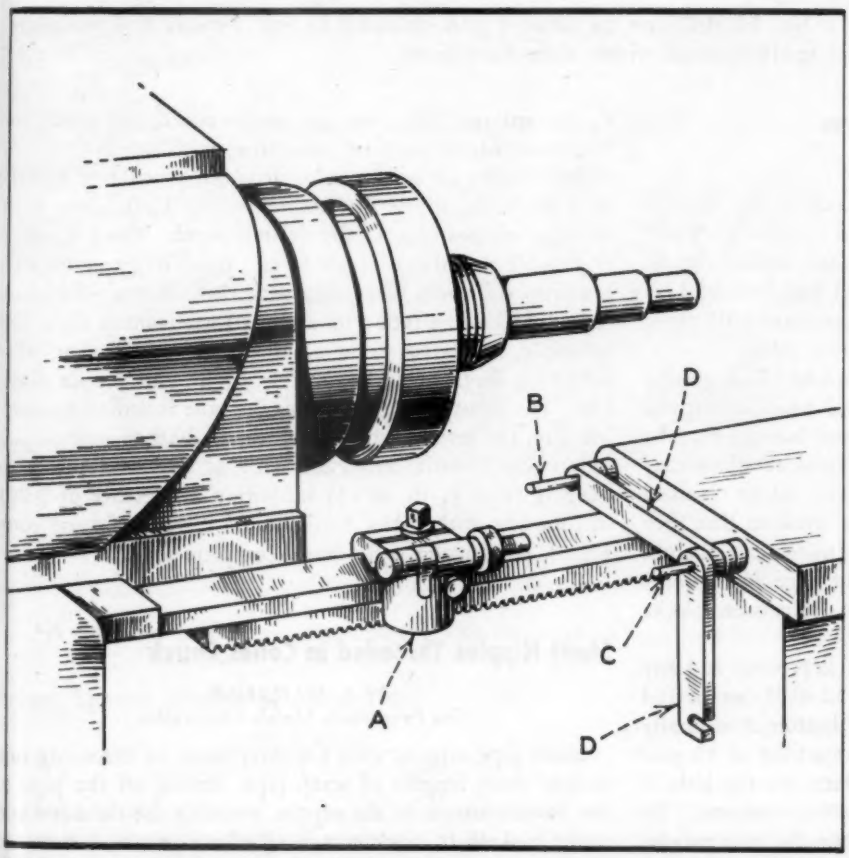
Grinding of small part G was speeded and simplified by making an ejector to fit into a standard grinder collet

Chucking Small Pieces on a B & S Grinder

BY JOHN D. BOWMAN
Bendix Aviation Corporation, Wayne, Mich.

Removing extremely small pieces from the collet of a Brown & Sharpe grinder is sometimes slow, difficult and often results in the operator getting skinned knuckles, so a special holding and ejecting device was developed as shown in the accompanying illustration.

For part *G*, a standard collet *A* was provided with an ejecting pin *B* retained in body *C* and spring loaded, as at *D*. Parts *B* and *D* are retained in *C* by screw *E*. The complete ejecting unit can be a press fit in the collet. When grinding is completed, the operator releases the collet and the ejecting pin kicks the piece into the parts box. Holder *F* was provided to make easier the loading of pieces into the collet. *War Winning Suggestion from the Board of Individual Awards, War Production Drive.*



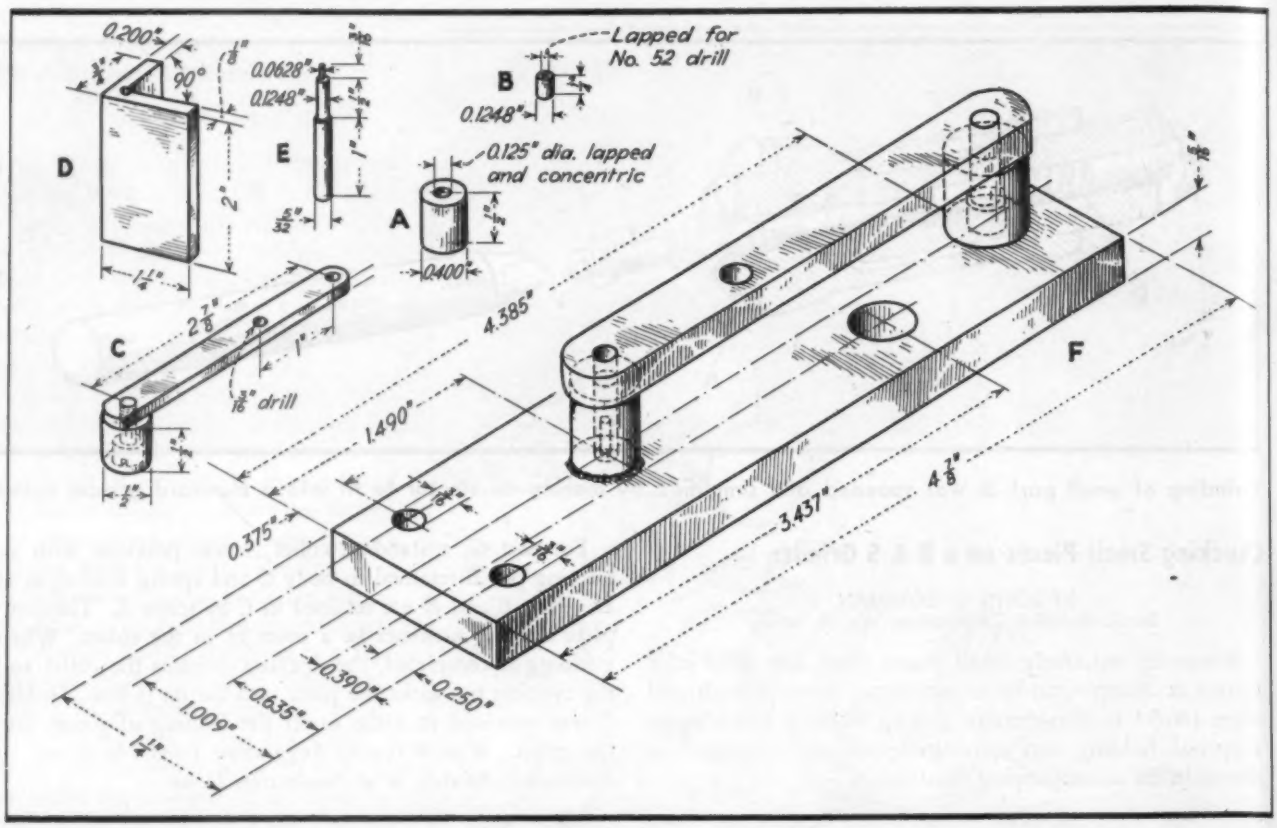
When turning a quantity of shouldered shafts, these spacer bars mounted on the lathe carriage can be used with a micrometer stop to reduce machining time. Total bar width controls the stop

Lathe Stops Arranged To Turn Shoulders

BY ARTHUR K. BAKER

A lathe stop for use when machining a number of identical pieces turned to two or more diameters was recently developed in our shop and has proved a real time-saver. We use micrometer stop *A* for preliminary adjustments, and a stop bar in the tailstock turret to control the length of bar protruding from the lathe spindle.

The lathe carriage was drilled and reamed for pins *B* and *C*, inserted in a position which would not interfere with the normal operation of the lathe. In use, a number of rectangular cold-rolled bars *D* were drilled and reamed to be a slip fit over pin *C*, and slotted for dropping over pin *B*. When bars *D* are allowed to hang perpendicularly, they do not contact the micrometer stop when it is in position and the carriage is moved toward it; however, when they are placed horizontally, resting on pin *B*, they act as spacers to stop the carriage at points corresponding to the shoulders on the workpiece. The spacers can be arranged in sequence and tipped in and out of position as turning progresses.



Buttons press-fitted with bushings for a No. 52 drill can be located and clamped to jigs, fixtures and templates for spotting holes within close tolerances

Laying Out Holes to Close Tolerances

BY JOHN ZOLLINGER

An everyday occurrence to the toolmaker is the accurate placing of holes in dies, jigs, fixtures and templates. While a number of such holes can be located and drilled on the milling machine and jig borer, the tools and method here described, which requires the use of a precision drill press, offers flexibility and easy handling of many jobs.

The method requires at least two hardened and ground buttons *A* press fitted with drill bushings *B* which are lapped to receive a No. 52 drill. More of these buttons may be added as the need requires. Arm *C*, several of which may be required as problems present themselves, can be clamped to hold the buttons tight enough to the work so that they may be set properly by micrometer, vernier scale, height gage, or other measuring tools. Straight edge *D* is useful when making measurements; otherwise, Johanssen blocks may be used according to circumstances.

Drill bushing *B* in button *A* must be kept clear and any clamping device so placed that a No. 52 drill can be fed through the button for spotting. After button *A* is finally set and clamped, it is further secured by a fillet of 50 percent resin and 50 percent beeswax. Once set, the hole is spotted with a No. 52 drill, and the button removed. To make certain that no errors have been made, the hole may be drilled deeper and checked with plug gage *E*. The procedure explained is repeated until all holes are located.

This method was used in laying out the holes in template *F*. To enlarge holes, we use counterbores, the pilots and bodies of which must be concentric, with the pilot fitting within 0.0002 in. in the hole. It is our practice to enlarge all holes to $\frac{1}{8}$ in. by first counterboring $\frac{1}{8}$ in. deep, then drilling and reaming to the desired depth. From $\frac{1}{8}$ in. it is possible to enlarge up to $\frac{5}{8}$ in., providing counterbores are properly made, preferably with three flutes. The counterbore should be 0.001 in. smaller than reamed size. The principle, of course, is to establish accurate location of a hole to a depth of approximately $\frac{1}{4}$ in. and proper diameter. The theory being that after the hole is drilled to reaming size, the reamer will follow the established hole.

We have made templates with as many as 95 holes ranging from $\frac{1}{8}$ in. to $1\frac{3}{4}$ in. within a tolerance of 0.001 in., starting with a No. 52 drill. As various jobs are completed, parts made will form a complete set.

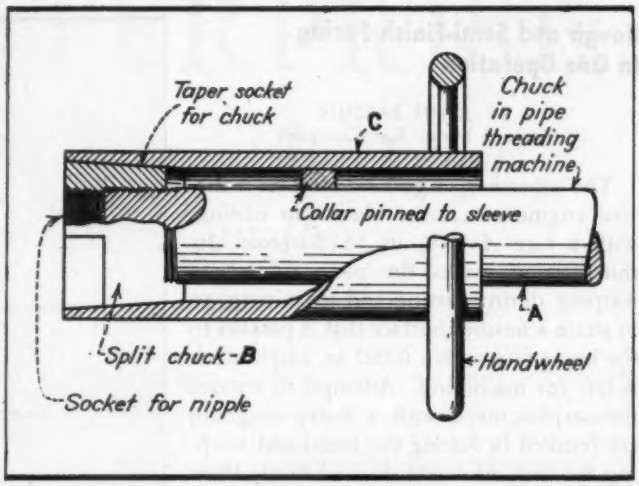
Short Nipples Threaded in Collet Chuck

BY I. D. PERRINE
The Permanente Metals Corporation

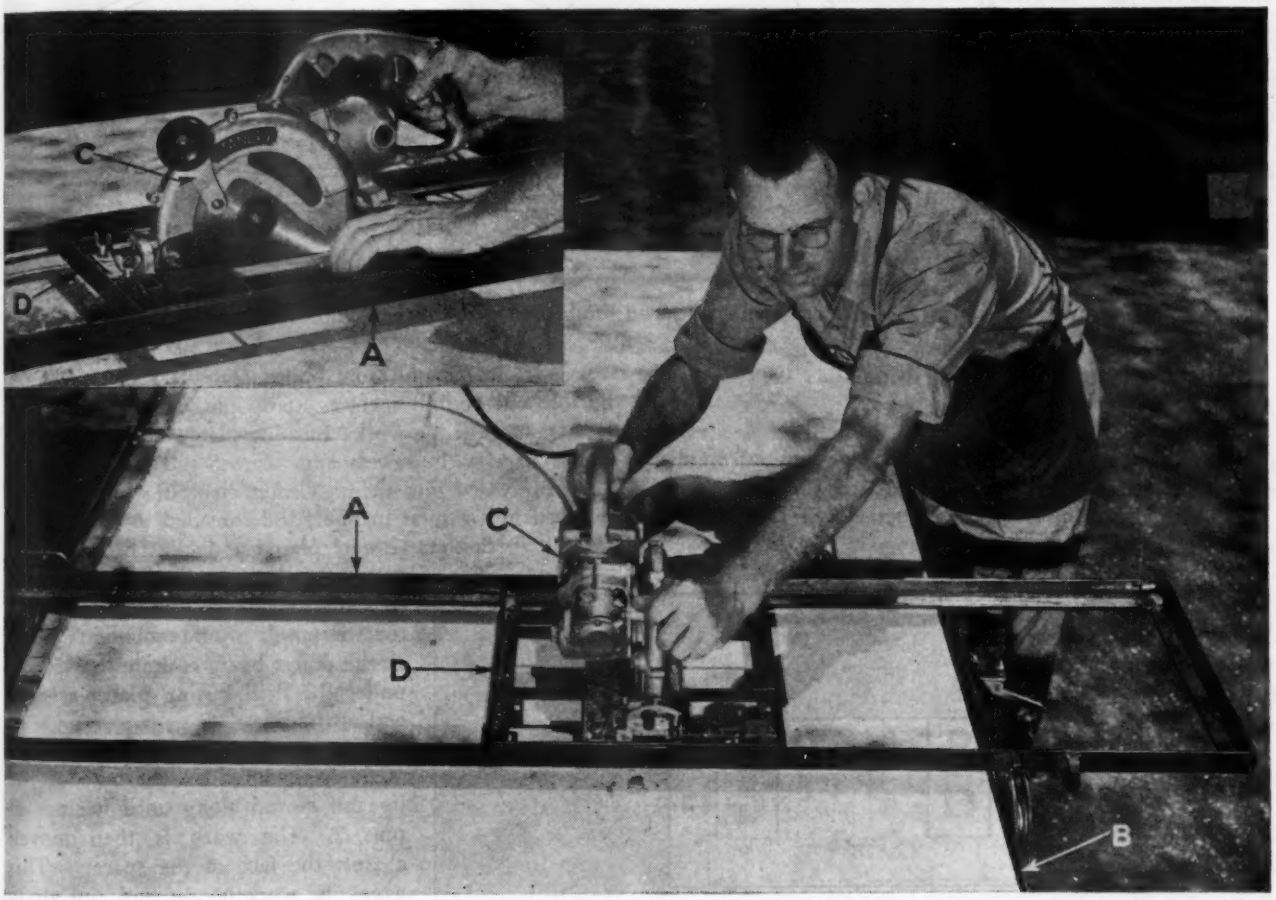
Short pipe nipples were formerly made by threading one end of short lengths of scrap pipe, cutting off the pipe to the desired length of the nipple, screwing the threaded end into a makeshift chuck composed of a pipe sleeve threaded on a short length of pipe, and threading the blank end of the nipple. The nipple was then gripped with pliers and twisted out of the sleeve chuck. In removing the nipple in

this manner, the threads were marked and sometimes, if the nipple was tightly seated, it would be squeezed to a slightly oval shape.

This is now avoided by using the collet chuck shown in the drawing. Stem *A* is secured in the rotary head of the pipe threading machine. Split collet chuck *B* is threaded and screwed to the other end of stem *A*, and is contained by sliding sleeve *C*. After a short nipple is screwed into chuck *B* and tightened by pushing sleeve *C* forward, threads are cut on the nipple. Sliding sleeve *C* toward the operator releases chuck *B* and the nipple can be unscrewed by hand. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Short nipples are threaded while held in this collet chuck. When chuck pressure is released, the nipple can readily be unscrewed by hand



A portable power saw is mounted in this carriage to facilitate trimming sheets of plywood and Masonite

Fixture Speeds Sawing of Masonite

BY C. DERHO
Northrop Aircraft, Incorporated

The illustrated table and sawing fixture was designed to cut, rip and trim large sheets of plywood and Masonite for aircraft parts and tools, replacing the use of a conventional bench power saw. The width and length of this table takes standard size sheets of plywood and Masonite.

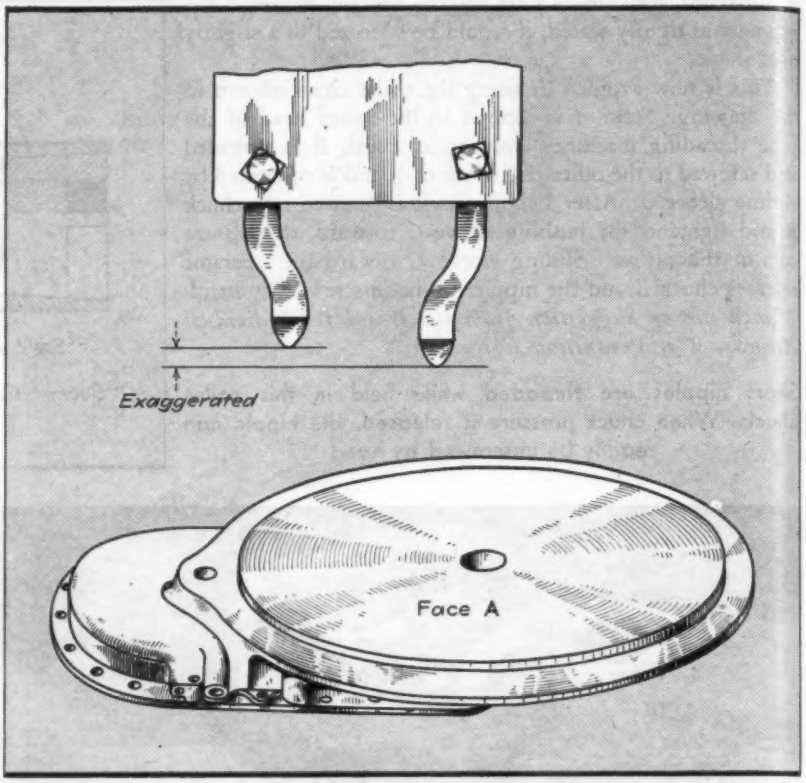
Carriage *A*, fitted with rollers, runs on angle-iron tracks *B* paralleling the edges of the table. Portable saw *C* is clamped in carriage *D*, which is square in shape so that it can be placed in carriage *A* in the two positions shown in the illustrations. For ripping, carriage *A* rolls the entire length of the table. For cross-cutting, carriage *D* is pushed across the width of the material. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Rough and Semi-Finish Facing In One Operation

BY JOHN BARTNIK
Packard Motor Car Company

The supercharger gear housing for a marine engine is a large aluminum casting, with a face *A* 19¾ in. in diameter. Its thin section makes the piece subject to warping during casting and machining, so to attain a finished surface that is parallel to the lower face within 0.002 in. ample stock is left for machining. Attempts to remove the surplus metal with a heavy roughing cut resulted in tearing the metal and warping the face, so it was decided to use three cuts on the job—roughing, semi-finishing and finishing.

This method was satisfactory, but took too long, so the present method was devised under which roughing and semi-finishing cuts were taken simultaneously with two toolbits held in the same toolholder, as shown in the accompanying illustration. The tools are staggered in the holder to reduce strain on the part. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Two staggered toolbits take rough and semi-finish cuts simultaneously

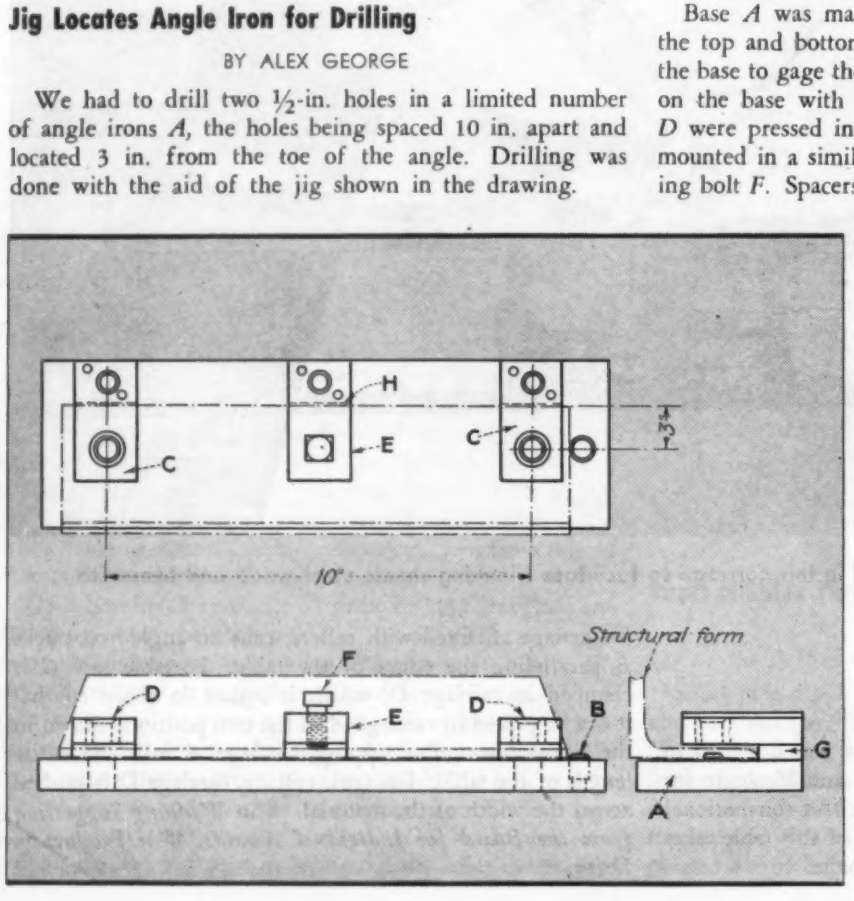
Jig Locates Angle Iron for Drilling

BY ALEX GEORGE

We had to drill two ½-in. holes in a limited number of angle irons *A*, the holes being spaced 10 in. apart and located 3 in. from the toe of the angle. Drilling was done with the aid of the jig shown in the drawing.

Base *A* was made from boiler plate and machined on the top and bottom surfaces. Stop pin *B* was inserted in the base to gage the work. Bushing plates *C* were mounted on the base with dowels and screws, and drill bushings *D* were pressed into them. Center clamping block *E* was mounted in a similar manner, and threaded to take clamping bolt *F*. Spacers *G* were placed under the drill bushing plates to allow the work to enter the jig, and a clearance was made at *H* so that the angle would not touch block *E*, the object being to lcate the spacers under the drill busing plates at each end of the jig.

In operation, the structural steel angle is mounted on the base of the jig and moved along until it stops at pin *B*. The work is then moved against the face of the spacers. This gages the work on the end and along the edge to obtain the dimensions required. The angle is held in this position by clamping bolt *F* while the two ½-in. holes are drilled through bushing *D*.



This drill jig was designed to locate an angle iron for drilling two ½-in. holes accurately spaced 10 in. apart and located ½ in. from the toe of the angle

FREE ENTERPRISE

The Obligation of Management and Labor to Cooperate... in War... in Peace

The Invasion is on! We have unleashed our full might for military victory. We have confidence that our great strength will bring success. We are strong because we have achieved unity in mobilization and in combat.

Though victory appears assured, we cannot rest until we have done everything in our power to speed the day when death and destruction are halted.

The home front is an important factor in this time element, for the fighting power of our Armed Forces depends upon their weapons. Napoleon's army fought "on its stomach"—man against man. Eisenhower's men fight on their tonnage—tanks, artillery, machine guns, heavy bombers.

As never before in the long succession of wars, the legends of heroic deeds on the battlefronts in this world conflict will be paralleled in history by the great accomplishments on the production fronts. Along with these heroic achievements of our Armed Forces, the world will long remember the record of our production accomplishments which have made us the stongest military power in the world, as well as the arsenal of democracy.

As the conflict reaches its climax, as battles grow fiercer and more destructive, our responsibility becomes greater and more critical. We must coordinate our productive efforts with the same ingenuity and the same precision with which our Armed Forces have coordinated theirs. We dare not waste the productivity of a single man or machine in these critical days.

As our landing craft are discharging our fighting men on the beaches of Europe and the Pacific, they must not want for equipment. No interference with war production for any reason can be justified. There must be no picket lines in America!

The landing of American troops in France virtually has stopped all strikes in the United States. This is important and encouraging news because the prelude to Invasion, unfortunately, has been an epidemic of strikes. Time lost through strikes, during the first four months of 1944, was double that lost during the same period last year. April saw more strikes than any other month since Pearl Harbor, and in May the record again was broken. Here is what happened within two weeks in May:

> Nine thousand men in six Chrysler plants in Detroit were out when a jurisdictional dispute in a "soda pop" war between the American Federation of Labor teamsters and the Congress of Industrial Organizations fired their discontent.
>
> A three-day sit-down strike occurred among 950 employees in the B. H. Aircraft plant over the refusal of the company to discharge a superintendent unsatisfactory to the union.
>
> Thirteen hundred men in the Chevrolet transmission and axle plant at Saginaw struck over a no-smoking rule and a change in shift-starting time.
>
> Two thousand employees at the Browne and Sharpe Manufacturing Company walked out when a woman was hired to fill a job long held by a man.
>
> Production of penicillin, blood plasma, and other medical supplies was halted at two Detroit plants of the Parke Davis Company as 1900 employees struck for a ten-cent raise.
>
> Over 25,000 lumber workers in the Pacific Northwest struck because the War Labor Board denied their demand for a wage increase.

At the end of the third week of May, 70,000 workers in 26 plants in Detroit were idle because of strikes.

Strikes in Detroit alone reduced production as much as a moderately successful German air raid would have done. Far more important than their effect on output is the effect of strikes upon national unity and morale. To our home front and to our Armed Forces, strikes belie our pledge to back the attack with all the power at our command. Hence, strikes limit our all-out war effort.

Prompt and decisive action is needed to keep America free from strikes for the remainder of the war. Stoppages of work on the production lines cannot be condoned while lives are being lost in fighting the enemy.

Most union leaders realize this need and are preparing to impose discipline upon their members who violate the no-strike pledge. The Warehouse Division of the International Longshoremen's and Warehousemen's Union (C.I.O.) recently declared: "Strikes in this time of war are treason against the nation and betrayal of the interests of labor." A message sent by William Green to all heads of American Federation of Labor unions stated:

> "D-day is here. From now on until Hitler is finally crushed, every worker enrolled in the army of production must consider himself a part of the invasion forces of the United States and conduct himself accordingly. I call on you in the name of the American boys who are risking their lives under enemy fire to maintain uninterrupted production under any and all circumstances. Until victory is won every worker must give the same all-out service that our Armed Forces are giving on the field of battle."

Strongest of all was the appeal of R. J. Thomas, president of the United Automobile Workers, to members of his union:

> "Our union cannot survive if the nation and our soldiers believe that we are obstructing the war effort . . . there can be no such thing as legitimate picket lines . . . I appeal to our membership. If you value your union, if you want to live and serve after the war, we must restrain ourselves and our hot-headed brothers today. If we do not, there will be no union after the war."

Union officers are entitled to vigorous support from management and government in their efforts to prevent strikes. Behind many a strike is an accumulation of unsettled grievances. Managements are overworked, and many union shop stewards are new and inexperienced and do not always do their part in turning down cases which lack merit. Both of these conditions make it easy for large backlogs of unsettled grievances to pile up. A special drive to clean up unsettled cases and to prevent new accumulations of them is one way by which managements and local union officials can help shorten the war.

The government too has a contribution to make to the prevention of strikes—both through the prompt disposal of disputes and through firm action against the leaders of strikes. The National War Labor Board and the Regional Boards are disposing of over five thousand cases a month and have made an excellent record in reducing their backlogs. Nevertheless, the boards still have many old cases; and about one out of four strikes has been an effort to get action from one of the labor boards. The boards are entitled to cooperation from employers and unions in keeping down their docket. In instance after instance, cases are dumped in the lap of the board before the union and employer have made a real effort to get a meeting of minds and to work out settlements.

In the present emergency, strikes are an expression of the lack of adequate understanding and team work between unions and management. Any future great upsurge in industrial strife likewise will be due to misunderstanding. After this war this country must not go through another "1919" when the time lost from strikes reached an all-time high. With 13 million workers, or almost half of the non-salaried employees of the country, in trade unions, the power and prestige of unions is greater than ever. ***The long-run prosperity of the country requires that business and labor learn how to cooperate in supporting the policies which produce the largest possible profits and the largest possible payrolls.***

Although business is primarily interested in the largest possible profits, and labor is primarily interested in the largest possible payrolls, both objectives call for the same basic conditions. Payrolls depend upon the prospects for profits. If bad relations between business and labor or unwise public policies cause employers to take a pessimistic view of the outlook for profits, both employment and payrolls will be depressed.

Individual unions and individual employers always will have differences over wages and hours and the status of labor in particular plants or in particular occupations. Some disputes on such issues are inevitable, but resort to arbitration and calm intelligence can help greatly in avoiding strikes in the long run. Cooperation between labor and management is an economic necessity. In our kind of economy, payrolls and profits ***both depend upon the willingness and the ability of business and labor to work together in creating the conditions under which enterprise flourishes.***

The foundation for intelligent and effective cooperation must be accomplished by skillful and imaginative managers in plants throughout the country who are willing to help unions with their problems, and who are able to interest union leaders and their members in the problems of business. Union members and their leaders are keenly interested as a rule in the efforts of management to win new markets. They know that jobs depend upon the success of managements in improving the product, adding new items to the line, and, less frequently, cutting costs and prices. Employees like to be kept informed about what management is doing, what problems it is meeting, and what success it is having. Most of all, they like to have an opportunity to contribute their ideas and suggestions.

The recent epidemic of strikes should not blind us to the fact that even today there are more plants where managements and unions are on good terms than ever before in the country's history. Consider, on the one hand, the extensive and constantly growing efforts of unions to train and develop shop stewards and, on the other hand, the efforts of employers to teach foremen how to carry out the new responsibilities imposed upon them by union agreements. Unions and managements together are learning how to operate together such technical devices as time study and job evaluation. Managements which, several years ago, opposed the provision of umpires to interpret union agreements and to settle deadlocked cases today are taking the lead in suggesting such arrangements.

The war is reaching a crisis, and all groups in the country must be aware as never before of their common interests. This presents an opportunity which should be seized to lay the permanent foundations for more effective team work in American industry. Let history record that the days when Europe was being liberated also were the days when unions and employers were making unprecedented progress in preparing American industry for the return of the service men by developing policies of cooperation between business and unions. Such cooperation will help achieve a peace worthy of our efforts and our sacrifices.

President, McGraw-Hill Publishing Company, Inc.

Armament
SECTION OF AMERICAN MACHINIST

Oil cups on each machine tool or other unit of production equipment is marked with a color code indicating the type of lubricant to be used. Oil cans are painted to match the oil cup markings. Frequency of lubrication is specified on a card attached to the machine

Controlled Lubrication Program Curtails Failure in Machine Tools

BY FRANK A. SYLVESTER Supervisor of Lubrication, Supercharger Plant, Allis-Chalmers Manufacturing Company

CENTRALIZED CONTROL of lubrication services was established by the Supercharger Plant of the Allis-Chalmers Manufacturing Company to help maintain around-the-clock operation of the thousands of machine tools and other units of its production equipment. The fact that not a single unit has been out of service because of lubrication failure in the 18 months the program has been in effect testifies to its success. This is particularly impressive when it is considered that much of the equipment has been operated by inexperienced workers, trained almost overnight to make precision parts for aircraft superchargers.

A novel feature of the lubrication program is the use of a color code to identify the different types of oil and grease recommended for each machine. Oil cups and reservoirs on the machines are tabbed with celluloid rings or dots to indicate the proper lubricant. Oil-storage tanks in the oil house and individual oil cans are colored to conform with the lubricant falling under that color, as shown in the accompanying table.

Colored oil cans are used by operators on some machines equipped with drip-oilers which require frequent filling. Empty oil cans are exchanged at the tool cribs for ones already inspected and filled. Returned cans are inspected carefully before refilling to prevent contamination of oil.

Allis-Chalmers uses color code to assure servicing of machines with proper oils. Cards marked at individual machines after servicing provide complete daily records

Except for filling drip-oilers, machine tool operators are not responsible for lubricating the equipment they operate. This responsibility rests with the lubrication department crews, who work on schedules that assure the servicing of machines as required. The crews are charged with observing the machines and reporting conditions which might lead to break-downs. Safety and cleanliness factors are likewise reported to the works manager each week to tie-in with the preventive maintenance program.

Complete lubrication information is kept at each machine so that the newest oiler can quickly familiarize himself with the machine's requirements. Each completed servicing detail is marked by the oiler on the card. Daily inspections serve to indicate the frequencies with which changes of coolants or cutting oils are necessary. The individual record cards reveal to each crew shift any changes in lubricant or coolant prescribed for specific machines.

The lubrication crews use service trucks equipped with 30-gal. dispensers, each colored to conform to the lubrication code. Oil-measuring cans are likewise colored appropriately. The crew chief prepares the necessary records and maintains a master lubrication chart. Disbursements of oil from each truck are charged to the department receiving the material, and signed orders are brought to the oil house office at the end of each shift.

The lubrication department's reclamation division plays an important role in the program. All used oils are reprocessed by the latest of such equipment including settling tanks, steam-jacketed heating tanks, pressure filters and centrifuges. Samples drawn off batch tanks are given a laboratory check to determine whether the reprocessed oil matches new oil.

If a quantity of oil is off the standard, it is built up to the original grade or converted to a grade above or below the original grade by using a base or neutral oil recommended by the supplier's laboratory. Records for the first 18 months of operation indicate a loss of

ALLIS-CHALMERS MANUFACTURING CO.
SUPERCHARGER WORKS
G-394

LUBRICATION RECORD

E. No. 4156 Bullard Lathe Dept. #12

Lub. Points	No.	Kind of Oil	Amt.	Date Changed	Signed
Hydraulic					
Circulating	1	Green Label	18	10/10/43	Dale
Gear					
Headstock					
Apron					
Grinder Spindle	2	Lub. Pl. #205		Each Shift	
Vertical Ways-Slides	1	Green Label	1/16	Fill Daily	
Spec. Head					
Filter		Cleaned		10/10/43	Dale
Pump	3	Sou. #2		Weekly	
Coupling					
Fittings	50	Sand Label		Each Shift	
Pulley Bearings	2	Sou. #2		Each Shift	
Sight Feed					
Fixture					
Oil Cups					
2 Head Raising Reservoirs	1	Green Label	1/8 Each	Weekly	
Cross Feed	1	Green Label	1/16		
Head Raising Remarks		Green Label	1/16		
4 Work Table Jaws	4	Al. #33		Every 6 Mos.	
Power Traverse	1	Green Label	1/2		

Drain, Refill - Clutch Reservoir Every Wednesday

Lubrication record cards such as the one shown are kept for each unit serviced by the lubrication department. The card is kept at the machine for easy reference when the machine is lubricated or cutting oil is changed

COLOR CODE FOR OILS AND GREASES

Color	Type	Viscosity at 100 F.	Applications
White	Spindle Oil	55 to 60	High-speed bearings.
Yellow	Spindle Oil	123 to 128	Spindle bearings and oil cups.
Green	Spindle Oil	150 to 155	Oil cups, some spindle bearings and hyd. systems.
Blue	General Purpose Oil	275 to 290	Oil cups, ways and slides.
Sand	General Purpose Oil	650	Headstocks, gear cases, ways and slides.
Black	Gear Oil	1950 to 1975	Gear boxes and table drives.
Orange with White Stripe	General Purpose Oil	–	Pressure fittings and plain bearings.
Blue with White Stripe	Special Lubricant	–	Antifriction bearings, ways and other applications.
Red	Cleaner	–	In Protecto-Seal cans.

Note: Plain oil cans are used for cutting oils; name of oil must be inscribed on the can in each case.

less than 0.5 percent. The cost of reclaiming old materials averages 3 cents per gallon. These figures include the reclamation of lubricating oils, cutting oils, oils for air-conditioning purposes, and miscellaneous oils, all totaling more than 87,000 gallons.

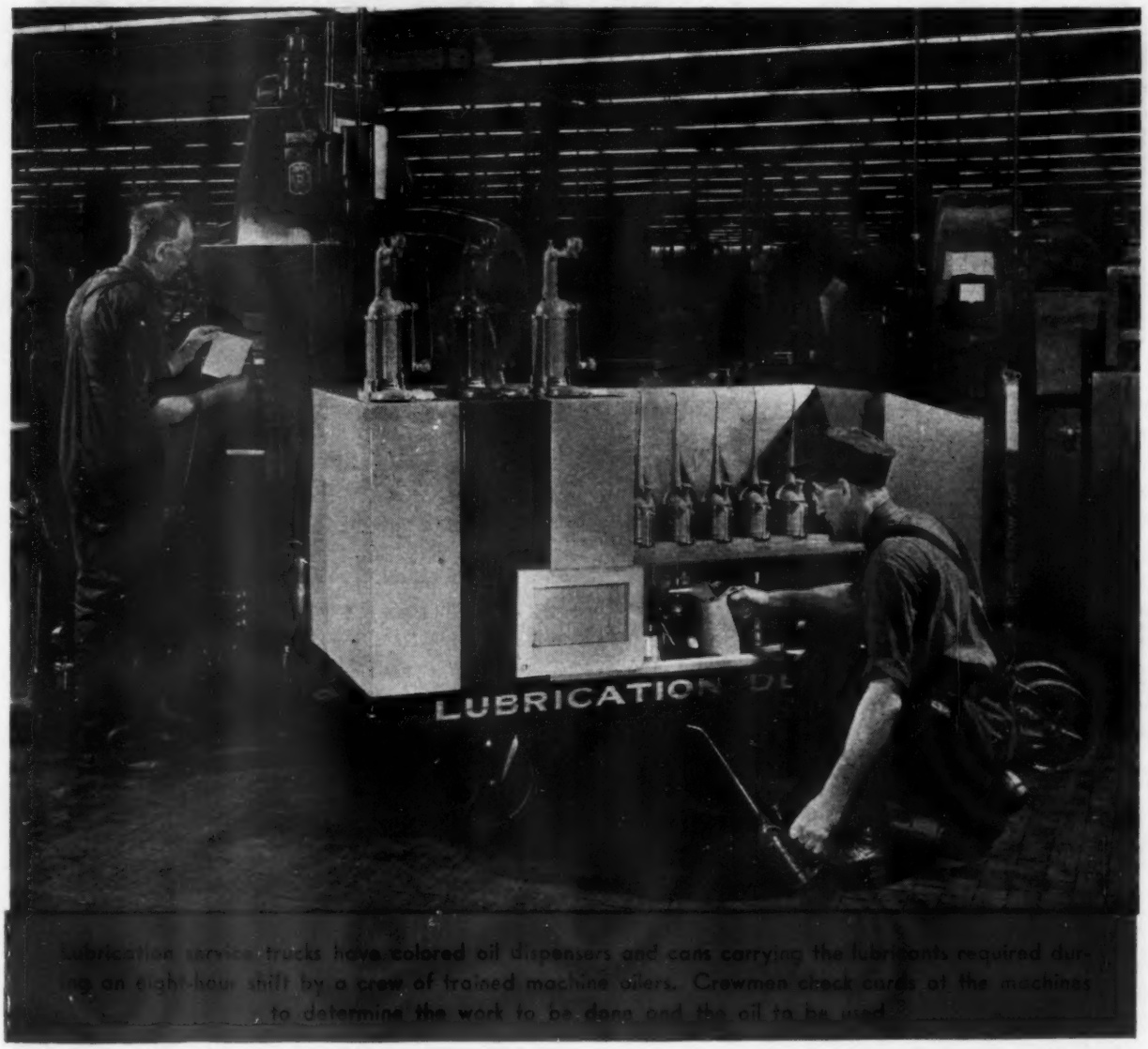
Consolidation of brands of material having the same basic structures has been accomplished with thread-grinding oils and with a number of cutting oils which have lost some ingredients through use. Upon its removal, the oil is sterilized, checked for balance of ingredients and viscosity, and reprocessed to the original specified quality.

The lubrication department supervises Zyglo and Magnaflux units in the production department. An oiler makes a concentration test daily at each of these units and adds magnetic paste or liquid to bring the ratio in balance. The units are cleaned daily and rinse tanks are scoured at regular intervals. The department also supervises the maintenance of degreasing units, which are drained regularly and the solution distilled for reuse.

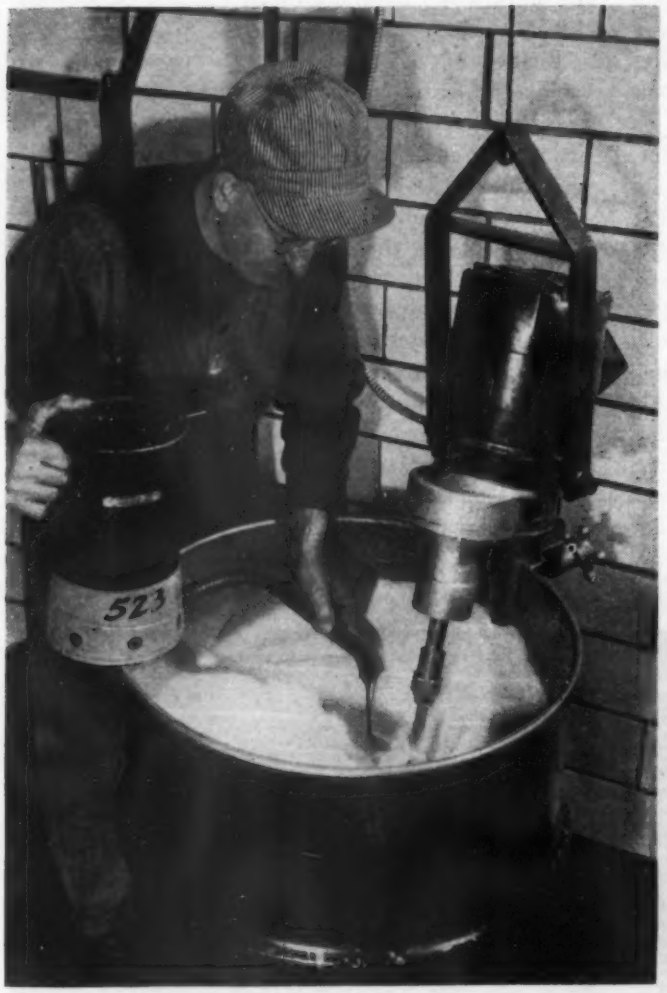
Reuse of quenching oils brings further savings. The same oil reclamation equipment is used and the standards are identical to those employed with lubricating and cutting oils. Quenching tanks are drained, cleaned and refilled with fresh material at regular intervals.

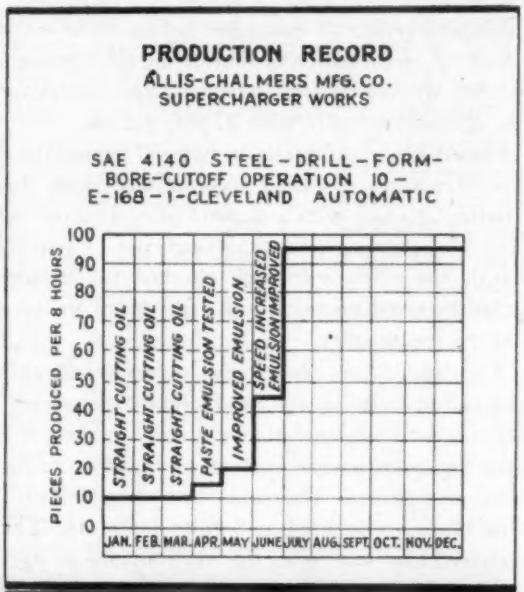
Reclamation of oils is performed on a business basis. Departments are charged on the basis of their receipt of new oils, and credited with the oils returned by them for reprocessing. The cost of handling and reprocessing represents the difference.

The Supercharger Plant has maintained a low percentage of industrial dermatitis through constant vigilance for organic materials in coolant reservoirs. Before new oils are purchased the safety division examines samples and marks its approval or rejection. Reclaimed materials are checked thoroughly for harmful bacteria. As a further control, samples of coolants



Lubrication service trucks have colored oil dispensers and cans carrying the lubricants required during an eight-hour shift by a crew of trained machine oilers. Crewmen check cards at the machines to determine the work to be done and the oil to be used





By experimenting with the coolant employed in an automatic lathe, production was increased from 10 pieces in 8 hours to 96 pieces in the same length of time, as shown by the chart

Soluble oil coolants are mixed as needed, according to ratios specified on the lubrication record card at the machine. Frequent changing of coolants and cutting oils combats dermatitis

are taken at random from machines for laboratory analysis. Operators heed a hard-and-fast rule against spitting into coolant reservoirs. Reports of organic material or refuse in coolant tanks bring immediate vigorous action. Dermatitis control is especially important because of the large number of women operators employed.

The lubrication department takes a particular interest in extending the life of machine tools. It has analyzed the requirements of each cutting and grinding operation. Charts at each machine offer a running account of tool life, pieces completed, tools replaced, reason for replacement, and types of cutting fluids used. Additional coolant lines were placed on some operations, while changing the direction of flow increased tool life on other operations.

The success of a particular emulsion in an automatic screw machine warranted a trial in an automatic lathe. The initial problem was more severe than usually encountered in machine operations. Various heavy-duty oils were tried until one was found which allowed the production of ten pieces in eight hours. The formula was changed to give more extreme pressure characteristic to the coolant. The correct proportions were obtained by observing the results of various mixes, using different proportions of the same ingredients. The final emulsion resulted in the phenomenal production of 96 pieces in eight hours.

The completeness of records is important. Record cards at individual machines are duplicated in a master file. Where oil changes can be made on a periodic basis, the master file indicates the next change date and a notice is sent beforehand to the responsible foreman. Selection of machines to be serviced is made by departmental location and by type of oil. The latter permits the changing of hydraulic reservoirs together, and eliminates the need of mixing grades of oil.

The lubrication department has achieved an enviable record based on applying the right oil in the right place in the right way at the right time. Of course experienced lubrication men are most desired, but new men are well trained and restricted to servicing a limited number and type of machines until they obtain sufficient experience. Lubrication men have contributed many suggestions for improved production.

ALLIS-CHALMERS MFG. COMPANY
SUPERCHARGER PLANT
WEEKLY EQUIPMENT INSPECTION REPORT

DATE: 1/18/44

BY: Roy F Klumb

DEPT. No. 10

Mach. No.	NAME	Lub.	Cool-ants	Appear-ance	Mech. Cond.	Sur-round	Date	REMARKS
2028-1	Cin. Cy. Gr.	✓	✓	✓	✓	✓	1/7	Hyd. Oil Emulsified - Reported By Tool Reqn.
								Table Removed - New Gasket Installed
								Hyd. Oil Line Badly Worn.
								Tool Reqn. Issued - Replaced.
2986-1	Heald Gr.	✓	✓	✓	✓	✓	1/7	Hyd. System Emulsified - Reported To Foreman — Oil Changed
982-1	Gridley Auto.	✓	✓	✓		✓	1/7	Coolant Inspected And Replaced
159-6	J & L Thread Gr.	✓	✓	✓		✓	1/7	Coolant Inspected And Replaced
136-2	Ex-Cell-O Gr.	✓	✓	✓	✓	✓	1/8	Coolant Refrig. System Not Functioning Properly - Temp at 97°

Foremen in the lubrication department prepare weekly equipment inspection reports showing the machines where hydraulic oil, coolant or cutting oil reservoirs have been cleaned and refilled, the machines where mechanical troubles have been reported by their men, and where preventive maintenance has been necessary

Reclamation division equipment consists of settling tanks, steam-jacketed heating tanks, pressure filters and centrifuges for reclaiming used oils returned from production departments after reservoirs have been cleaned and refilled. Laboratory tests keep reclaimed oil up to the required quality

Production Analysis Shows Manpower Needs in Advance

By D. E. HAYES, Supervising Engineer, Manufacturing Engineering Department, Plant B, Lockheed Aircraft Corporation

Detailed production information often permits shifting of labor from section to section, thereby assuring proper flow of finished parts with minimum manpower

AN ANALOGY can be drawn between the battle front and production front, for behind each, similar types of planning must be done by the respective chiefs of staff. Plans must be formulated to meet unforeseen shortage in manpower, and just as troops are shifted from one position to another to strengthen the weak links forming our chain of strategy, so must workmen be shifted in assembly lines to meet production quotas.

As the services demand more and more men, productive manpower must be adequately distributed to meet schedule delays and material and manpower shortages. The mere fact that a department is behind in its production, according to schedule, is too indefinite and does not give a true picture of where the bottleneck occurs. For instance, a department may have the required number of men, sufficient material and still fall down on production because of misdirected men, machines or materials.

The Manufacturing Engineering Department of Lockheed Aircraft Corporation conducted a work analysis survey in an effort to provide the production departments with specific knowledge relative to weaknesses and bottlenecks throughout the factory so that corrective action could be started.

Fundamental knowledge sought in this analysis was a clear picture of just what information was required and where this data was available or could be obtained in the shortest possible time. Various reports and records were found to contain these data, but they were not condensed in one form and could not readily be analyzed by either production departments or manufacturing engineers. Therefore, it was decided to produce a special form carrying all of the needed information. Several analysis sheets were designed and tried until a form was found that seemed to meet all requirements.

A typical sheet is shown in an accompanying illustration. This happens to be for department 107. It sets forth a complete analysis of this department's manpower requirements, broken down for each section, as well as the status of all orders in process and in storage in each section.

Many of the column headings are self-explanatory, but the information carried in these columns might well be explained. The second and third columns, "Recommended Manpower Increase or Decrease" and "Present Manpower," cover all three shifts—graveyard, day and swing. Changes are made only after a thorough investigation of all conditions that could possibly affect any section in the department. Present manpower figures are obtained from the weekly personnel report and is a weekly average.

"Behind Date Orders in Loading Station" column gives the originating sectional breakdown of all behind date orders which are on hand in the loading station and information is obtained from production records on the day the work analysis sheet is compiled. This shows the load that can be released into the section due to the heavy volume and is generally a good place to watch for bottlenecks.

Figures in the "Available Men for Temporary Loan Only" column show where manpower may be obtained on a temporary basis without creating a critical shortage elsewhere. The figure shown is based on load conditions which are expected to develop in the near future.

These reports indicate weekly production output, and by referring back to the preceding weekly figure a picture of changing conditions is easily formed. When recommendations are made for manpower an attempt is made to equalize shifts. On the analysis sheet shown, it may be noted that more manpower is

recommended for section "A," which happens to be the punch press section. This recommendation is made from information given on the report, plus other known factors and anticipated changes. In this particular case, it is sought to build up personnel and train new operators for new punch presses which are to be delivered to handle work being transferred from pin routers to the presses.

This report also shows that section B-2 has some work, but that none of it is behind schedule. This healthy condition indicates that it has the manpower to loan some men temporarily to some other section which may be afflicted with a cycle of heavy illnesses or absentees for a few days; or men may be needed for a few hours.

Also shown is the fact that section "F"—the drop hammer section—has more orders than can be handled conveniently. Total behind date orders is also heavy in the section as well as at the loading station. Storage from this section has also gone up.

According to the sheet, section I-3 needs more manpower due to overload and an increase of orders in storage, but it also indicates that the extra help is needed only on the graveyard and swing shifts. It likewise discloses that section "J" has too much manpower on the graveyard and day shifts. This is indicated by the fact that only 41 orders are in the section and that there is a decrease of 17 orders in storage.

A surplus of manpower on all shifts is shown for section U-1. This is true because total orders in the section are below the minimum desired and because the orders in storage decreased from 17 in the previous analysis to 0 in this one. It also shows that work in this section is being transferred to section A.

In section "U-2" no increase is recommended, although the loading station has 121 orders behind date

DEPT. 107 DAILY WORK ANALYSIS SHEET

Calendar Date_____

Sec	Recommended Manpower Increase or decrease			Present Manpower			Total Pres. Manpower	Behind Date Orders in L.S.	Behind Date Orders in Sec.	Total Orders in Sec.	Desirable Min. Max. Orders in Sec.	Total Orders in Strg. for Sec.	Inc. or Dec. of orders in storage for Sec.	Available men for Temporary loan only
Sec	G	D	S	G	D	S								
A	2	12	4	28	18	26	72		198	495	400-700			
B1				9	12	13	34		426	716	500-1000			
B2				29	33	29	91		..	81	75-125			20
O.P.														
C1				3	4	4	11		10	18	10-20			
C2				9	8	12	29		57	101	50-100			
C3				3	3	2	8		12	16	10-20			
C4-5				4	4	2	10		11	11	10-20			
Spec				12	13	11	36		..	..	..			
C-6														
D1				14	14	18	46		31	90	40-124			
D2				13	20	16	49		26	114	30-175			
D3				7	4	7	18		7	18	10-25			
D5														
E1				11	15	12	38		18	41	25-60			
E2				8	7	7	22		10	359	300-500			
F	12	8	12	28	32	28	88	106	121	213	50-150	37	14	
G				2	3	3	8		1	5	10-30			
H				4	3	3	10		10	24	15-100			
I-12				43	55	46	144		127	279	95-250			
I	6		4	12	18	14	44		38	159	25-125	17	9	
J	(17)	(11)		59	53	42	154		15	41	100-200		(17)	
L				14	18	10	42		5	23	15-30			
Q				3	3	3	9		4	12	5-20			
R				7	8	8	23		37	93	50-100			
S1-S2				45	53	45	143		130	426	350-600			
U1	(9)	(15)	(7)	29	35	27	91		8	97	150-250		(12)	
U2	(Watch)			58	48	37	143	121	145	323	200-450			
U3														
U4														
Deg														
Erco														
Total				454	484	425	1363		1447	3735				

Note: Additional Men Needed in Drop Hammer First

All decreases will be circled.
The above changes are for the leveling of work flow by sections.
Order Closeout for week — 6 days 5559
Average daily closeout 926

After several other forms were tried, this analysis sheet was developed by Lockheed manufacturing engineers to help production men determine increases and decreases in manpower requirements in each section of a department. Figures in brackets represent recommended decreases in manpower.

in addition to those in the section. Here there are only 145 behind date orders, consequently the load is not especially heavy and it might level out. Therefore, a note "watch" is indicated for this section. This note serves as a warning and, if the section gets overloaded, manpower may be borrowed temporarily from the 20 employees available in "B-2."

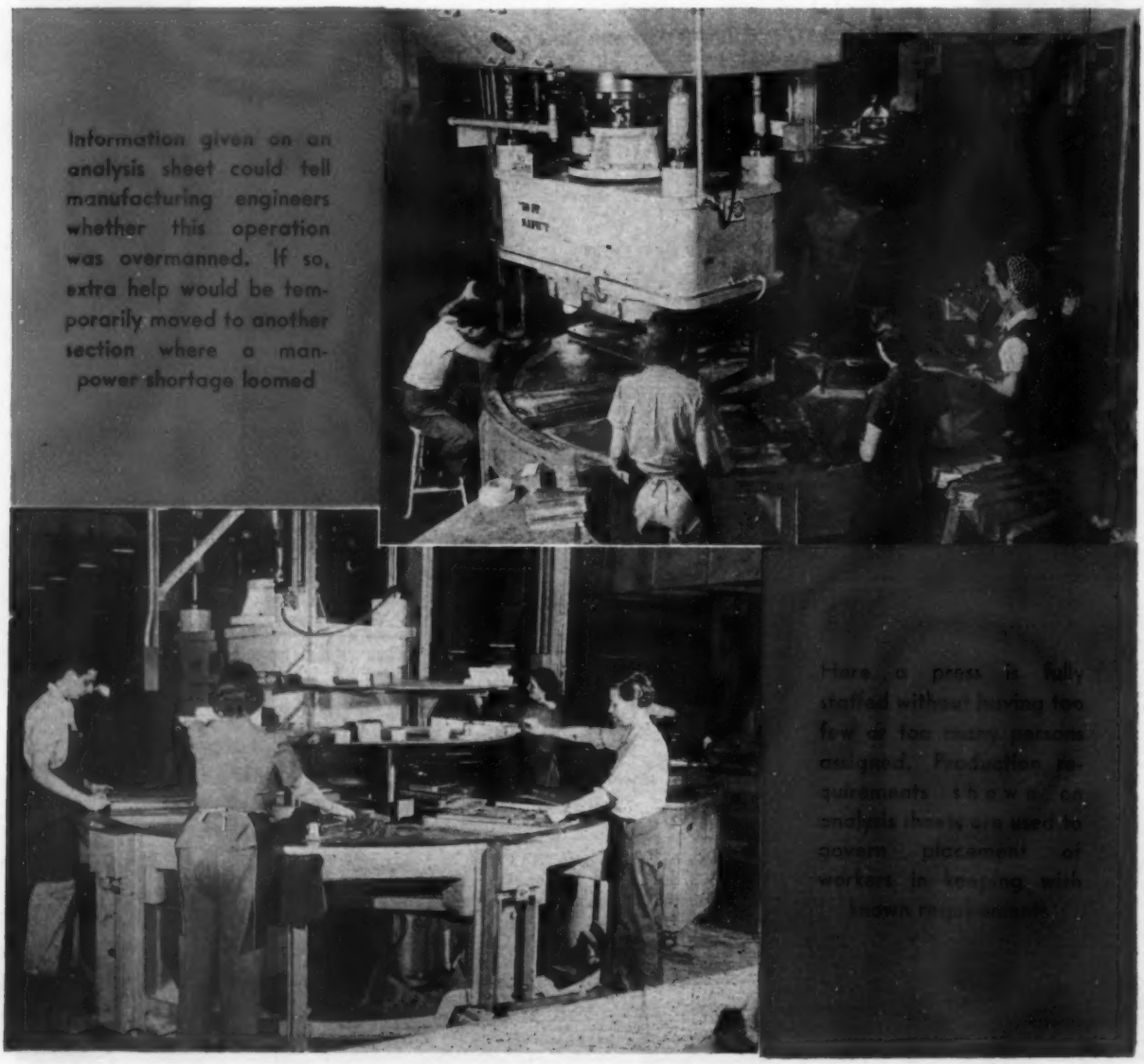
By adding figures in the following table, all of which are taken from the analysis sheet, it is shown that 60 employees are needed, but that 59 are available from other sections. By making the shifts as indicated, serious production bottlenecks may be avoided.

Section	Manpower Increase
A	18
F	32
I-3	10
	—
	60

Section	Manpower Decrease
J	28
U-1	31
	—
	59

To obtain 60 additional employees is not the answer to the problem, as the 59 employees in the section where work is slack will soon be a problem, as morale and efficiency of employees sink when there is not sufficient work. This condition spreads to other workers throughout the entire department.

In this article, the manpower shifted and the orders in the section are for illustration only, to show what can be done. A few weeks after this system was put into use, bottlenecks were eliminated and very little shifting of personnel was necessary, mostly as a result of such studies as these.



Information given on an analysis sheet could tell manufacturing engineers whether this operation was overmanned. If so, extra help would be temporarily moved to another section where a manpower shortage loomed

Here a press is fully staffed without having too few or too many persons assigned. Production requirements, shown on analysis sheets, are used to govern placement of workers in keeping with known requirements

Letter Symbols for Gear Engineering—I

This American Standard (B6.5-1943) was jointly sponsored by the American Gear Manufacturers Association and the American Society of Mechanical Engineers, and has been approved by the American Standards Association.

1 Purpose. The purpose of standard letter symbols for gear engineering is to establish a uniform practice in mathematical notation for equations and formulas dealing with toothed gearing. Such equations and corresponding calculations may be in connection with design, application, manufacture, inspection, new methods, and new problems.

Standard letter symbols are not intended or suggested for use on working drawings or in manufacturing records. The principal use of standard symbols is in the mathematical work in published articles, papers, and books, to make understanding more easy and confusion less likely.

2 Manuscripts. It is recommended that authors preparing manuscripts dealing with calculations involving gears adopt the symbols in this standard for usual gear terms, and for other terms and symbols in general mathematics, science, and mechanics refer to other lists of American Standard Letter Symbols, particularly to that for Mechanics of Solid Bodies (ASA Z10.3—1942). The terms for which symbols are used should be clearly defined and a table of notation given, or else reference should be made to the standard source from which they are taken. Definitions of standard terms in gearing are included in the Recommended Practice of the American Gear Manufacturers Association on Gearing Nomenclature.

3 Symbols. In this standard a symbol is a single letter used to represent a numerical value in equations and formulas. Two or more symbols appearing together, one immediately following another, indicate multiplication, as: $ab = a \times b$.

It is particularly important to distinguish accurately between upper-case and lower-case letters.

Symbols must be distinguished from abbreviations which are merely shortened forms of words, such as first letters, often used on drawings and in tables, but not suitable for mathematical notation. For example the symbol for circular pitch is p, whereas the customary abbreviation is CP.

The system of symbols and subscripts here presented is generally consistent with those appearing in other American Standards, and follows the same general principles. It is not restricted to standardized gear terms and relationships, but provides for extension to new problems and new investigations.

The allocation of the letters of the English alphabet as symbols for terms in gearing is indicated in List 1. The use of Greek letters is shown in List 2.

4 Subscripts. A subscript appearing immediately after and somewhat below the general symbol is used to indicate a value applying to a particular gear or tool, or a value taken at a particular position or in a particular direction. For convenience and brevity, it is desirable to use a general symbol without a subscript when only one value of a given kind is involved. Thus in a spur gear or a straight-tooth bevel gear, there is occasion to consider only one cross section of the teeth, namely, the transverse section; and it is convenient and natural to refer, for instance, simply to the circular pitch p and the pressure angle ϕ. In the case of gears with oblique teeth, on the other hand, it is usually necessary to be specific and to refer to the transverse pitch p_t and the transverse pressure angle ϕ_t, in order not to leave any doubt as to whether values are being given for the transverse plane or normal plane.

In simple determinations involving only one gear and one pinion, a convenient way to eliminate subscripts is to use upper-case symbols for values applying to the gear and lower-case letter symbols for values applying to the pinion. This may be allowable even with letters listed differently in the standard, as long as confusion is avoided by properly explaining the notation used. Examples: D, d for diameters; N, n for numbers of teeth; T, t for tooth thicknesses; Γ, γ for pitch angles.

The general plan for allocating the English alphabet as subscripts is indicated in List 3.

It should be noted that with only one or two exceptions capital letters are used to indicate values applying to a particular part such as a gear, pinion, tool, or cutter, thus:

a_P = addendum of pinion
D_C = diameter of cutter
ϕ_T = pressure angle of tool

These capital-letter subscripts thus stand for *nouns*.

Lower-case letters are used to represent *adjectives*, which indicate kind, position, direction, thus:

p_b = base pitch
p_n = normal pitch
ϕ_x = axial pressure angle

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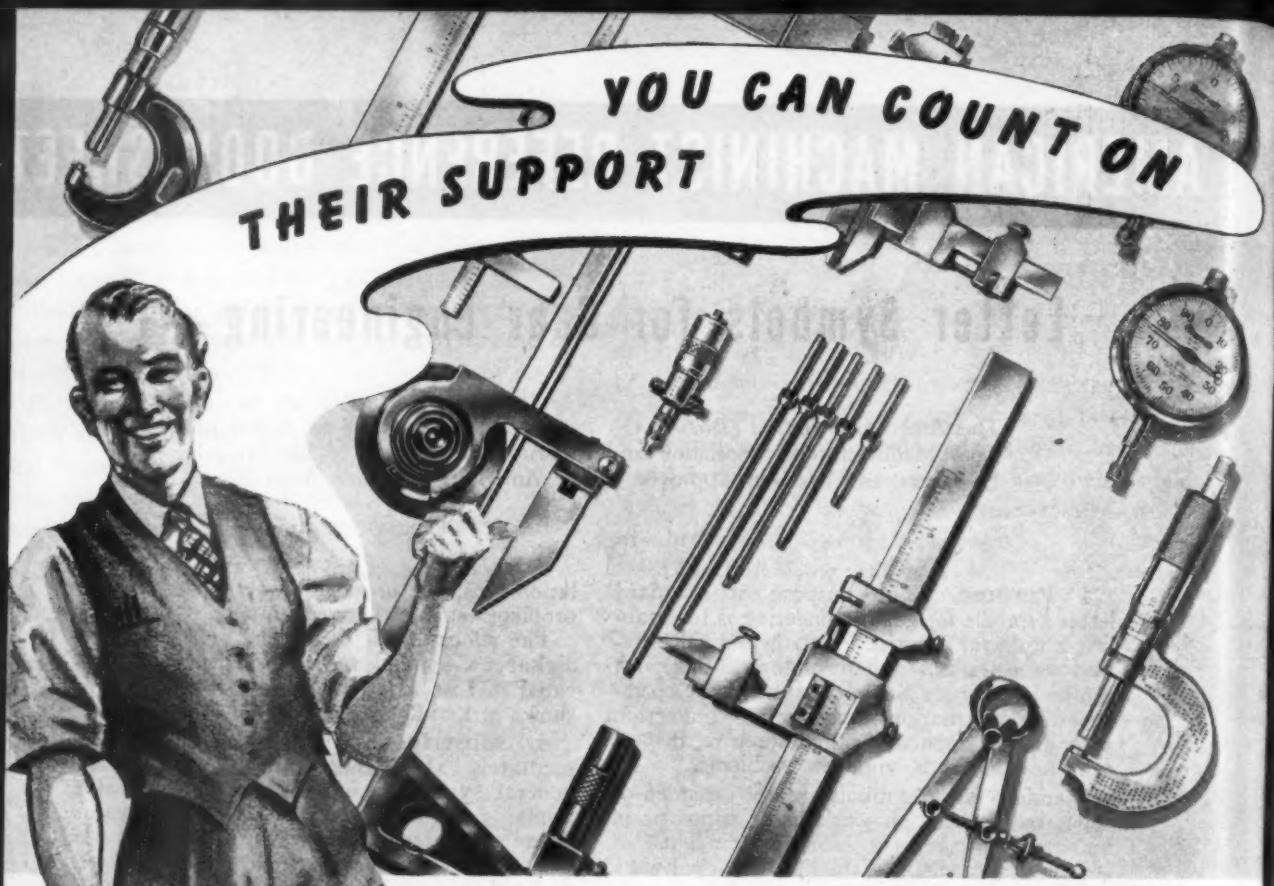

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Letter Symbols for Gear Engineering—II

As has always been done in mathematics, numerals can be used for subscripts whenever desired, as d_1, d_2, d_3, etc.; but letter subscripts selected from significant words are easier to remember.

5 Conflicts. In a few instances the same letter appears as the symbol for two different terms in this standard, and of course there are numerous cases of conflict between symbols in different fields. This is not a cause of confusion, unless the two terms or meanings occur in the same equation or formula. Then one way to remove doubt is to apply subscripts. In such a case an author should be careful to list the terms and symbols which he uses.

6 Typography. In accordance with the usual practice in published text, letter symbols and letter subscripts, whether upper or lower case, should be printed in italic type. In manuscripts this is indicated by underlining each symbol to be italicized. Coefficients, numeral subscripts, and exponents should be printed in vertical Arabic numerals. Standard mathematical notation should be followed.

List 1 Allocation of English Alphabet for Gear Engineering Symbols

A	cone distance	*a*	addendum, acceleration
B	backlash	*b*	dedendum
C	center distance	*c*	clearance
D	diameter	*d*	diameter
E	offset (of axes)	*e*	
F	face width	*f*	
G		*g*	
H		*h*	depth, height
I		*i*	
J		*j*	
K	factor (general)	*k*	
L	length	*l*	lead
M	bending moment	*m*	ratio, module (British or metric)
N	number of teeth	*n*	revolutions per unit time
O		*o*	
P	diametral pitch, power	*p*	circular pitch
Q	face advance	*q*	
R	radius	*r*	radius
S		*s*	distance, stress
T	torque	*t*	tooth thickness
U		*u*	
V		*v*	velocity, linear
W	load (total)	*w*	load per unit length
X	strength factor	*x*	
Y	tooth form factor (diametral pitch)	*y*	tooth form factor (circular pitch)
Z	length of line of action	*z*	

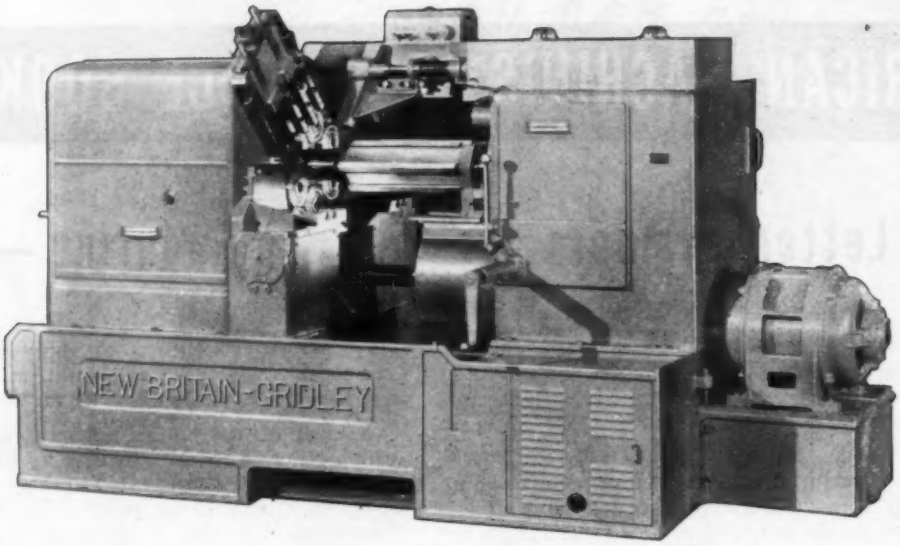
List 2 Greek Letters Employed in the Standard

A. General Angles in Gears

α	(alpha)	addendum angle
δ	(delta)	dedendum angle
ψ	(psi)	helix angle, spiral angle
λ	(lambda)	lead angle
Γ, γ	(gamma)	pitch angles
ϕ	(phi)	pressure angle
Σ	(sigma)	shaft angle

B. Miscellaneous Terms (Common to Other Fields)

α	(alpha)	angular acceleration
ρ	(rho)	radius of curvature
θ	(theta)	angular displacement (angle in polar coordinates)
ω	(omega)	angular velocity



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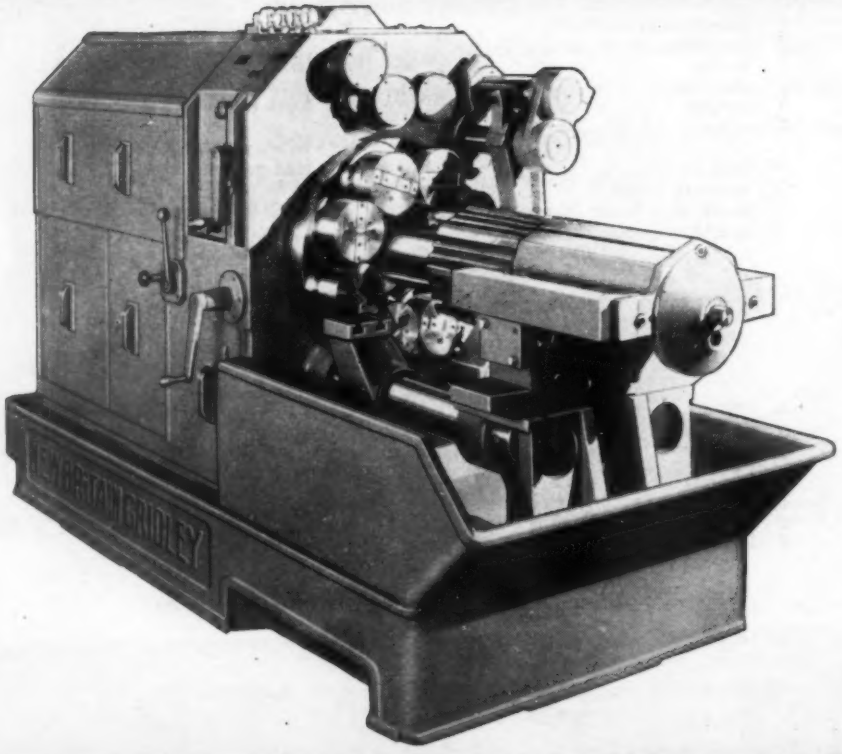
A complete line of multiple spindle screw machines to 2¼" capacity. Also a complete line of chucking machines—four, six and eight spindles up to 10¼" capacity.



ARMY E NAVY

NEW BRITAIN-GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

Gaging Business

Orders Rise

Orders booked by machine tool builders during May amounted to $61,000,000, having exceeded shipments by $20,000,000. May was the second month in succession in which the long downward trend in new business in relation to production was reversed. Output, at $41,000,000, was on a par with that during April. No reports are in yet on June, but a continuation of the high rate of fresh orders is indicated by preliminary estimates. The policy ruling of the War Production Board, permitting the machine tool industry to take and fill orders for postwar requirements is expected to bring in the next 30 days a further large volume of business. These orders, however, cannot be filled if they interfere with war priority orders. This means that the builders with light backlogs and relatively short deliveries should benefit from the new ruling which will help to spread business out more evenly over the whole industry. The automobile people are expected to be the biggest single source of orders for postwar, asking mostly for special purpose machines or standard machines with special tooling. Even if the machine tool industry finds it difficult to take care of postwar orders for some time, because of war commitments, the new ruling will have the merit of permitting builders to get much of the preliminary engineering work done in connection with the tooling, saving a lot of time later on.

Battles Change Production

While overall war business is holding at recent levels, much shifting around is being done to meet changing needs. As a result of heavy tank losses in France and Italy, tank production is to be stepped up sharply after having been cut back to rather low volume over a period of many months. The extra output will be secured mostly by enlarging production at plants now active, most of them being in the automotive industry. In at least one railroad equipment plant, and perhaps more, in which tank production had been halted permanently, operations will be resumed as quickly as possible. By contrast with this expansion, a cutback has been announced in manufacture of airplane-type .50 caliber machine guns at all seven plants making them, though the heaviest sufferer will be Colt Firearms with a reduction of 40 percent.

Heavies are Pushed

Pressure is being exerted to speed the production program for heavy shell, heavy artillery and heavy-duty trucks. Naval ordnance output is ahead of schedule in certain categories, and cutbacks are looked for in several major items, including small arms ammunition. The timetable for small landing craft is being met so well that a decreased schedule looms ahead, but production of the larger sizes will be pushed hard the next few months.

Ships Still Urgent

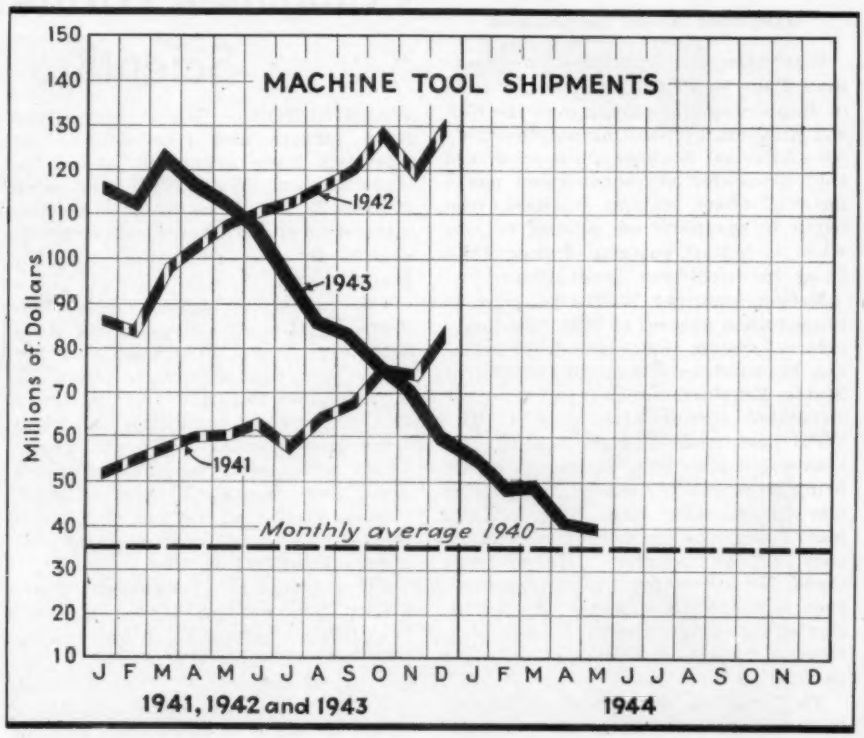
Merchant ships will continue to be built at a rate of 1,600 to 1,700 a month, with no reductions contemplated until a year hence. Many of the faster ships are being requisitioned by the Navy as quickly as they are ready for service. High officials believe it possible to increase shipbuilding by 20 percent if the men employed in the yards could be induced to work harder. Yards have been hard hit by manpower shortages. At the end of this year the U. S. merchant marine will consist of 50,000,000 deadweight tons.

Planes are Grounded

With the exception of a few types of planes, such as long-range bombers, plane production is being held down by the needs of the services which have decreased recently. Planes are still pouring out of U. S. factories at an amazing pace and considerable shifting of operations on various plane types is expected. Boeing's Seattle plant, for instance, will devote its entire output to B-29's, the Flying Fortresses being taken over entirely by other plants and companies. Sizable cutbacks in plane contracts in the near future will not surprise the industry. As of today, only about one-fourth of the Army's entire war production program is being expanded and only one-twelfth of it presents severe problems. The munitions industries have been discharging workers at a rate of 100,000 a month all of this year and this trend is likely to continue.

Little Civilian Output

These developments should not raise one's hopes, however, that production of civilian goods is to be resumed on an important scale in the immediate future. The Office of Civilian Requirements is in entire agreement with the policy of the services in securing military items in excess of needs rather than take a chance on being caught short at a critical moment. The OCR believes that civilian production must be held at a minimum so long as the military situation is taut and so long as manpower is short. Anyway, the lack of enough component parts, such as small motors, will be an effective preventive to resumption for awhile.



Leveling Off—Rise of machine tool orders since March to $61,194,000 for May has halted the decline that has marked recent shipments. Preliminary May figures indicate: shipments, $41,712,000; cancellations, $1,342,000; backlog, $186,343,000

Disregard Competitive Relationships in Reconversion Plans

Reconversion is to be allowed, provided there is no interference with war production. Critical civilian production will be given priority for available raw materials

WASHINGTON—Hedged with warnings that weapons production in the next three months will be as critical as at any time in the entire defense and war program and with the blunt statement that 200,000 additional workers must be made available for war programs, WPB's plans for easing into reconversion by the manufacture of scarce civilian goods in the "soft spots" left by shifting military programs was made public by Donald Nelson recently.

Nelson disclosed three steps taken to help industry plan and prepare for reconversion. They are:

1. Authorization of sufficient materials and components to build and test a single working model of any product planned for peacetime production.
2. Revocation of WPB orders limiting the use of aluminum and magnesium so as to allow use of these metals in essential civilian production.
3. Authorization, effective July 1, of purchase of machinery, tools and dies for civilian production. These are to be purchased wherever possible from existing surplus stocks, but may be ordered from manufacturers, with specific WPB approval, if not otherwise available.

Manpower Needs Emphasized

War Manpower Commission Chairman Paul V. McNutt wasted no time in dampening enthusiasm over the Nelson program by pointing out that 200,000 additional workers are needed, and that discussion of reconversion has a harmful effect on war workers, who begin to speculate on moving to jobs with a better postwar future than those in direct war production.

Nelson admitted WPB's program is hinged upon success of WMC's priority referral system under which all males can be hired only through the United States Employment Service or other stipulated agency after July 1. The WPB boss made it plain that his reconversion plan was contingent on its being kept entirely out of the way of war production, and that civilian moves would be junked immediately if they did so interfere. He ascribed these limited steps toward reconversion partially to a desire to demonstrate the government's desire for a smooth transition from war to peace production.

The program announced by Nelson bade a conclusive farewell to earlier attempts by WPB to insure that prewar competitive relationships be maintained so far as possible in reconversion. Under the program, those manufacturers who are still tied up on war work when their competitors are ready for civilian production will have no recourse, nor will there be any move to keep newcomers out of civilian fields.

WPB released, meanwhile, a list of 203 civilian items which are not only scarce but are also badly needed. Grouped in three classes, representing acute shortages, serious shortages and shortages, some of these items are already approved for production. Others are not, and their production will await the release of such components as fractional-horsepower motors or bearings.

Manufacturers who seek to enter civilian production through a showing of ability to do so without competing in the least with the war program will be checked against the product shortage list, and shortage products will be given materials before non-shortage items. Until motors or bearings are available without infringement on war production, however, the public which needs electric refrigerators may find itself getting metal cocktail shakers instead.

Numerous electrical appliances, such as refrigerators, ranges, sewing machines and vacuum cleaners are on the acute shortage list.

TOOL PRICING SIMPLIFIED

WASHINGTON — The Office of Price Administration has simplified and consolidated the regulations governing pricing of new machine tools, attachments and parts without changing price levels.

The new regulation freezes prices in effect on Oct. 1, 1941, instead of freezing list prices of that date. Provision also was made to allow addition of a resale discount or commission to the price of a new tool, attachment or part distributed by the manufacturer through a dealer for the first time. In addition, a method of pricing new tools, attachments and parts which represent more than a modification of a product for which a maximum price is established has been included in the new regulation.

Leases and rentals of new tools have been added to the new regulation, and earlier "freeze" prices for these services have been replaced wherever possible by dollars and cents rates.

Committee Formed to Push Postwar Scientific Interest in Materiel

WASHINGTON — High Army and Navy officers and four outstanding scientists have organized under the leadership of WPB Vice Chairman Charles E. Wilson to promote postwar interest of civilian researchers and inventors in scientific problems of the armed forces.

The committee, appointed by War Secretary Henry L. Stimson and Navy Secretary James Forrestal, met formally for the first time June 22. Sources close to the Navy Department and others close to Wilson and other committee members, said the group, which will merely recommend a program and procedures, was of spontaneous origin and did not result from instructions or a suggestion by any high administration official.

Emphasizing the informality of the group, a committee spokesman said that there has been no decision as to what will be done with whatever plan is worked out by the committee. It was assumed the recommendations would be made to secretaries Stimson and Forrestal, who, it was believed, would pass them along to the President if they met with their approval.

Chairman Wilson paid tribute to the nation's scientists and emphasized the importance of their participation if the postwar United States is to "keep ahead of all possible future aggressors in preparation for national defense."

Rules of Priority Referral Manpower Plan are Outlined

WASHINGTON—War Manpower Commission has outlined requirements which will have to be met by employers seeking additional labor from areas other than their own, under the "priority referral" plan which went into effect July 1 on a nationwide basis covering virtually all male workers, and women as well in some localities.

Employers seeking such help under the plan must show full utilization of their manpower and local inability to fill needs. After rating by local essentiality committees, they will have to show that their work is being or will be impeded by lack of manpower.

They will be allowed to recruit and advertise only in WMC-designated areas. Where necessary, employers will pay transportation expenses to the job, as well as return expenses for those rejected and must guarantee that housing will be available.

Inside Detroit

BY SILER FREEMAN

Trucks Are Tops

Heavy trucks have become the No. 1 item on the list of war needs, pushing aside tanks, heavy artillery, invasion landing craft and ball bearings from the top position. Tanks and the big guns were recently announced as having top place but the War Production Board has now decided that trucks are the "must" item.

Consequently even the tank program must now take a back seat, because many of its component parts would interfere with the production and would "rob" the trucks. Detroit manufacturers are bending every effort to turn out the big fellows as fast as possible. So far, progress has been slow. They are behind production schedules badly.

Trucks Versus Tanks

In Chrysler tank arsenal, the effects of the new orders may prove a bit confusing. Since its tank program has been cut back sharply, the tank plant has been turning out truck parts.

Now with tanks badly needed in the Battle of Europe and trucks even more badly needed, the question is shall the arsenal continue to make truck parts or because of the expanded tank program, shall it turn its full attention to tanks again, at which it has set such a fine record. The decision is still not made.

In the Hush-Hush Stage

Chrysler is at work on the new low silhouette tank. It is pretty much hush-hush and involves an electrical drive in which the General Electric Co. is cooperating. General Motors Diesel also has a hand in it, which makes it quite a cooperative affair. It is reputed to be heavier and more effective than the sturdy M-4.

The expanded tank program may bring Fisher Body's Grand Blanc tank plant back into heavy production. It is now engaged on some secret work.

The Ford tank plant, however, is not expected to have any part in the program. It has been dismantled and is now engaged in plane parts production. It would take too much time to reassemble the jigs and fixtures, replace the tools and equipment, plus the additional handicap of manpower.

Foundry Manpower Worse

But where the entire program hits a big obstacle, which is turning white the hair of every executive in the regional War Production Board, is the situation in the forge and foundry industry. The manpower situation in that industry, which has always been bad, is becoming dangerously critical, according to Carsten Tiedeman, regional chief of the WPB.

Tiedeman is frankly worried about the foundry situation and describes it as "desperate." Although forgings and castings are only about one per cent of the total war production, they are used for end products totalling 50 per cent of military shipments, he pointed out.

Employment in the industry has declined steadily since last April and is expected to continue until August. It may mean as much as a 25 per cent reduction in production of the vital truck, tank and gun schedules.

The foundries in this area are important. From them come the malleable iron castings for landing craft, motor trucks and farm machinery. Gray castings go into cylinder blocks and cylinder heads, as well as freight car wheels. Steel castings are needed for railway cars and locomotives; drop forgings for landing craft, airplanes, tanks and heavy truck engines.

The foundry and forge industry has a backlog estimated at from four to six months. The crisis in manpower is expected to be felt next November and Tiedeman fears the whole war program may be affected.

Efforts Bear Fruit

The auto industry has been cheered by the recent action of Donald M. Nelson in allowing the manufacturers to place orders for vital machine tools and the freeing of materials for experimental models. This has been in the mill since last April and the services are still very much opposed to the WPB move, claiming it will interfere with war work.

For more than a year the industry has attempted to sell WPB on the idea. Both Nelson and C. E. Wilson, his chief aide, have been favorable to it. But the services bitterly fought it.

While it is not a great victory for the industry, it is a start on their reconversion program. The placing of the orders on the books of the machine tool builders will give the latter an idea of what they face in the postwar era.

"As and When" Orders

There is now a plan being broached to issue "junior priorities" from manufacturers to their suppliers. The orders would be held on the books of the suppliers until X-Day and would give the suppliers a chance to figure future production on the total of their backlog of orders.

This plan is just being thought out and is not by any means a certainty. The suppliers would be given help in financing these orders and would be permitted to warehouse the finished products, if the manufacturer were not ready to receive them in the quantities turned out.

Tubes on a Bender—There's many a bend twixt the nose and the tail of a new Boeing "Flying Fortress" or "Superfortress" and most of them are in tubes carrying electric wires and control. To speed bending of tubing, this machine was developed to make between 900 and 1,200 bends a day

Central Office to Handle Contract Termination Review

WASHINGTON—With the Murray-George contract termination bill finally approved by Congress, Washington and war manufacturers both were awaiting the appointment of a director of contract settlement and establishment of the machinery and regulations under which contractors will be paid off.

As finally passed, the bill differed only a little from that originally introduced early this year by Sen. James E. Murray. It establishes an office of contract settlement with a director appointed by the President. This agency will make the rules and see that procurement agencies—Army, Navy, Maritime Commission, etc.—follow standard procedures. The director will be assisted by a contract settlement advisory board, representing these agencies.

Procurement agencies will terminate and settle their own contracts, with those entailing claims in excess of $50,000 subject to review by a board of three or more representatives of the agency. Boards will be constituted for each district or division office of the procurement agency. Their failure to act on a claim within 30 days will make a settlement final, subject only to review for fraud. The comptroller general enters the picture only to make sure that payments are in line with settlements and to check for fraud.

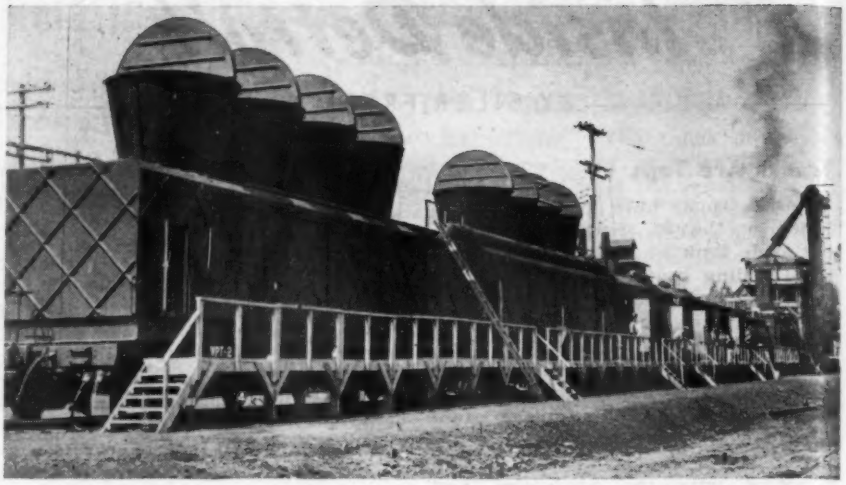
Procurement agencies are authorized to provide interim financing for contractors whose work has been terminated. Payments will run 100 percent on completed work and 90 percent on inventory and semi-finished work, including a reasonable amount for overhead.

Where no agreement on a claim can be reached, the procurement agency makes a unilateral determination of the claim, which the contractor can appeal either to an appeals board set up by the act or to the U. S. Court of Claims, or both.

Batt and Dodd Head AMA

NEW YORK—William L. Batt, vice chairman, WPB, and president of SKF Industries, Inc., was reelected chairman of the board, American Management Association, and Alvin E. Dodd, president, at the annual business meeting.

In his annual report, President Dodd urged better planning and more consideration for employers and employees in the matter of terminations and transition into peacetime production. "The reconversion job is much too large for the amount of time that management has been able to give to it. Severe jolts in the way of contract termination can wreck our economy."



Power on Wheels—The Westinghouse eight-car power train with a 5,000-kw. output, designed to furnish electricity to devastated areas or new industrial installations, was described at the A.S.M.E. semi-annual meeting

Mechanical Engineers Treat Many Subjects at Semi-Annual Meeting

PITTSBURGH—Metals, metal working and the development of new metal products held a large place in the four-day program of the American Society of Mechanical Engineers' semi-annual meeting at the Hotel William Penn, June 19-22. Igor I. Sikorsky addressed the Wednesday night dinner on the subject of direct lift aircraft with A.S.M.E. President Robert M. Gates acting as toastmaster.

Machining came in for a good share of attention in the technical papers. J. Q. Holmes, master mechanic, Eastern Aircraft Div., General Motors Corp., spoke on the use of negative rake tools in the production of aircraft. His experience included the tooling of turret lathes and precision boring machines as well as milling machines.

Machining Emphasized

A similar topic was treated in a pair of papers presented by A. O. Schmidt, research engineer, Kearney & Trecker Corp. The first of these papers dealt with the thermo-analysis of tool forces in high-speed milling. The second paper, of which J. B. Armitage, vice president in charge of engineering for the same company, was co-author, told of the effect of radial rake angles in face milling.

Machinability of steel in its relation to yield stress ratios was described by E. J. Janitsky, consulting mechanical engineer, Carnegie-Illinois Steel Corp. This author derived an index of machinability based on the ratio of yield stress to tensile strength.

S. M. De Poy, metallurgist, Delco Products Div., General Motors Corp., noted the effect of grain size and sub-zero treatment on the productivity of four high-speed steels.

Improved methods of joining aluminum which will stimulate new uses of this metal were set forth in a paper by M. A. Miller, Jr., process metallurgist, E. C. Hartman, chief, Engineering Design Div. and G. O. Hoglund, Jobbing Div., Aluminum Co. of America. Procedures described included riveting, soldering, welding, brazing and resin bonding. Stepped extrusions for aircraft use save material and machine hours, according to Kirby F. Thornton, another Aluminum Co. speaker.

The heat-treatment of metals was covered in several sessions, one of which took the form of a panel discussion on recent developments in industrial furnaces. In addition, a paper by C. E. Peck, engineer, Industrial Heating Section, Westinghouse Electric & Mfg. Co., told of the applications of controlled atmospheres to the processing of metals.

Geddes Named Hupp President

DETROIT—R. S. Geddes, senior member of the Cleveland industrial firm of R. S. Geddes & Associates, has become president of the Hupp Motor Car Corp., Col. Willard F. Rockwell, Hupp board chairman, has announced. Col. Rockwell also stated an agreement has been entered into whereby Hupp acquires assets and business of the Globe Machine & Stamping Co., the 42-year-old Cleveland company of which Geddes is now president.

Wartime Washington

Pending Recess Sped Bills

The desire of Republican congressmen and senators to attend the party's presidential convention was primarily responsible for the passage of contract termination legislation before the convention recess. War Mobilization Director James F. Byrnes, who pleaded with Congress to pass the termination bill before taking a month off for the conventions, succeeded in exacting a promise from leaders of one branch of Congress that there would be no recess until the bill was agreed to and ready for submission to the White House. Inter-house difficulties which threatened to hold up the bill for some time, notably the exact status in termination proceedings of the comptroller general, vanished when the word got around.

Disputed portions of the bill were worked out at a night session of conferees, congressional leaders and the Byrnes people, resulting in what one administration man called a "perfect bill—one we wouldn't change if we could." As cleared, the bill limits the comptroller general to the determination, after final settlement, of whether the payments were made in accordance with settlement terms.

Personnel not Ready

Despite the passage of legislation on the matter, we are not nearly ready to handle extensive contract termination, in the opinion of one of Washington's top men. In trained manpower alone, this official believes, we are months away from being ready. Originally it was thought that 4,000 trained men would be necessary to handle all military termination. Now the need is apparent for that many trained men to handle the termination job of the Army Air Forces and Service Forces alone. These men must know intimately the termination act and regulations issued thereunder, regulations which have not yet been promulgated.

Election Delays Disposal Bills

The outlook for surplus disposal legislation is not considered bright by those most intimately concerned with getting a good law on the books in time for the deluge. One informed source is gloomy about the prospects of such legislation this year, and is positive that if it comes this year, it will not come before election. One big issue is the disposition of government-owned plants as opposed to tools, material and similar equipment. Westerners, for instance, want the steel plants which have been located on and near the coast kept in operation to give the region its first domestic steel supply. Eastern steel-producing states are skeptical of, if not outright opposed to, such a move. This single situation can be duplicated many times in other industries and localities. Congress is understandably hesitant to settle this question in an election year.

Another sticking point is in the anti-monopoly provisions of the surplus disposal legislation. The attorney general is known to favor a system whereby he would be allowed to pass on the question of conformity to the Sherman and Clayton Acts after plants had been sold. It is argued that such a line-up would be more effective in frightening away capital which might otherwise be willing to buy and operate government war plants than almost any other process which could be dreamed up.

To Profit by Experience

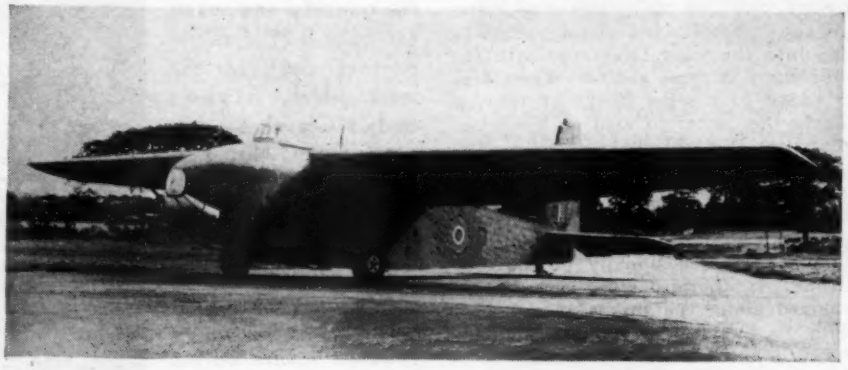
Experience gained in fighting the termination bill through Congress, where four separate committees considered the bill, will be applied to preparation of the administration's surplus disposal bill in an effort to speed up action when it does come. Each committee has been asked to submit in detail the provisions which it would feel compelled to resist if they were presented. In this way, it is hoped, virtually all objections can be resolved before the bill is drawn up and presented to Congress.

Certain leading thinkers on reconversion are drawing their plans for a quick and bitter fight against any proposals to keep war plants running after the necessity for their output has passed. Despite the pressure on manpower today, there is more pressure against job changing by workers whose contracts have been terminated than might be expected. As cutbacks grow and as less new contracts are available to replace terminated jobs, there will be more and more pressure to allow the completion of war contracts even though the weapons they call for are no longer needed. This will be particularly true as long as there is no specific legislation on the books relative to severance pay or increased unemployment compensation.

WPB Enters Terminations

As a result of the Brewster situation, it has been more clearly defined that WPB is to be a working partner in future terminations. The services will decide, of course, what they no longer need and to a considerable degree, for cost reasons and the like, where terminations can best be ordered among multiple producers. The matter will then be referred to WPB's production executive committee, which includes representatives of the services. PEC will look over the field to determine where cuts can best be made, and normally may be expected to go along with the services unless some specific reason for not following its recommendations becomes apparent. It might be found, for instance, that an inefficient producer which the procurement agency would like to drop from a given program cannot feasibly convert to other production, while another producer not scheduled for a cut could switch to a more urgent line. In such cases, PEC probably would dispense with recommendations that the inefficient producer be cut and terminate the contract of another producer to free him for other urgent work.

Bringing PEC into the picture, in any event, will be an additional safeguard against the possibility that a contract will be terminated as sloppily as was the Brewster contract, where the Long Island plant, supplying subassemblies to the Johnsville plant, was not notified that Johnsville was going out of the fighter aircraft business.



Tank Carrier—The hitherto secret British "Hamilcar" gliders, with a wing spread in excess of the 102 ft. four-engined "Lancaster" bomber, carried light tanks to Normandy beachheads during the beginning of the invasion

Spotting the Air News

Flaps Turn the Trick

Experience with the B-29 Superfortress Boeing bomber in this war may contribute importantly to the design of large postwar transport planes. Chief among its aerodynamic innovations is the variable-area wing. This feature is an extension, or flap, at the trailing edge, which constitutes a considerable proportion of the total wing area. This large area is used for the takeoff. In the air, the flap is drawn into the wing and the plane proceeds with a smaller area and a heavier per-square-foot wing loading, with which it would not be able to get off the ground except by a very long run. With the flap retracted, the wing section, called the Boeing 117, excels anything in its class in refinement and "speed." The flap, also used in landing, reduces the contact speed which would otherwise be excessive.

Peacetime Use Complicated

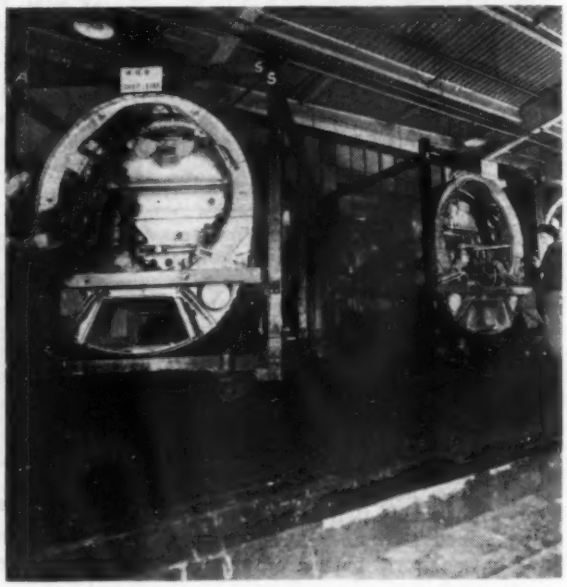
For commercial use, the variable-area wing has possibilities, and limitations. Many expedients can be used on military planes which would not be acceptable for civilian operations. There is a limit to the amount of moveable wing area that can be extended without structural and aerodynamic complications. Adapting the flap into the wing interferes with the rear spar, to some extent. When area is added to a wing, front or rear, it moves the center of load on the wing, changing its flight characteristics, and stresses. Variable area is only one version of flaps, used in various forms for many years, to slow landings especially, less frequently to shorten takeoff, and occasionally to boost altitude. If these devices can be developed along the line of the Boeing wing to reduce ground runs and add speed in the air, and at the same time reduce operating cost per ton mile, commercial air transport will want them.

Pressurizing Facilitates

Valuable lessons will be learned also from experience with the B-29's pressurized crew compartments. Part of the compressed air generated by the engine superchargers is diverted to the sealed quarters, keeping the inside atmosphere at comfortable density regardless of altitude, so that the crew is not hampered by the use of oxygen breathing apparatus. (Of course oxygen is carried for instant use in case a shell tears a large hole in the compartment. A small hole is blocked immediately with an emergency patch.) Boeing has already built several 45,000-lb. gross weight "314" Stratoliners with pressurizing equipment and sold them for operation on TWA and Pan American airlines before the war. The supercharging of passenger cabins will be a common thing on express airline runs after the war and undoubtedly Boeing will contribute much to its success.

Avoid Speed of Sound

Reduction gears in the B-29 cut the propeller speed to 35 revolutions for each 100 turns of the engine. This was necessary to keep the tip speeds of the 16½-foot Hamilton-Standard propeller below the critical speed, approximately the speed of sound, above which airfoils do not function normally. If very big airplanes are to be used postwar, big propeller disc diameters will be necessary to absorb the power of the big engines, and improved reduction gears will be needed to keep tips speeds down. Many other B-29 developments, including its electrification with 150 motors of 49 types, and many not yet mentionable, will contribute to transport design.



Super Smasher—Assembly of nacelles for the powerful engines of the huge B-29 is an important part of the work which Fisher Body's Cleveland Aircraft Plant No. 1 is performing for the Army Air Forces Superfortress. Here completed nacelles are shown ready for shipment. Fisher has reached volume output of B-29 parts and assemblies

Plan Plane Parks

Volume production and sale of light airplanes, by far the most promising future market, will depend extensively upon the development of community air fields. Everybody agrees that, until ground facilities are convenient, popular flying will get nowhere. The Aeronautical Chamber of Commerce outlines a plan under which local and state governments would finance the building of 20,000 "airparks" adjacent to townsites, to be parks in the common sense of the word, and to have airplane service facilities. These would cost upward from $10,000 apiece. In addition, the Aero Chamber wants the government to help build a string of "airstops" along highways, with coin-in-the-slot fuel service and rest rooms, for cross country flyers. The National Aeronautic Association is holding a meeting of all agencies and groups interested in airports, in an effort to get a coordination of requirements. The Civil Aeronautics Authority will soon propose to Congress a long-range airport program, for all types of flying. CAA will suggest that ports for interstate use be financed by the states matching funds with the federal government, on the pattern followed in building the U. S. highway system.

Notes for Your Book

Some air force officials are amazed that the ingenious Germans would engage in such a futility as the robot bomb planes. They can't come in miles of any target; only hope would be to "area bomb" the whole of England; Germany hasn't got the industrial power to produce enough to make a showing. . . . Army's Artillery, which uses grasshopper planes as elevated observation posts, is asking for simplified control and non-spin characteristics; pilots, operating close to the ground, are too busy to watch their flying speed. . . . New wind tunnel at Moffett Field, Calif., laboratory of the National Advisory Committee for Aeronautics, can handle full scale planes up to 80 feet in wing span. Tunnel cost $7,000,000; six 6,000 hp. electric motors drive six 40-ft. six bladed blower propellers. . . . The first twin-engined fighter to be used on carriers by the Navy is the Grumman F7F, now in production. It will operate from present standard fleet carriers. Navy's new 45,000-ton carriers, when completed, will accommodate planes the size of present twin-engined medium bombers, like the Martin B-26.

Dominion Plans Postwar Aid To the Small Manufacturers

OTTAWA—Small Canadian plants will have top preference in the acquisition of government-owned surplus machine tools and other production equipment. This is a first principle of the Dominion's war assets disposal policy. Objective is the further modernization and expansion of small manufacturing plants, increased postwar employment and broadened export.

Parliament is making provision, on the initiative of Finance Minister J. L. Ilsey, for creaton of an industrial credit bank to help small industrial firms to reconvert and expand, and new firms to get started. The only corresponding aid for larger industries is a plan to provide low-cost state insurance on export trade accounts. The insurance measure will be designed particularly to enable heavy equipment industries to meet foreign requests for long-term credits.

Must Junk Obsolete Equipment

Munitions and Supply Minister C. D. Howe is taking the precaution of providing against obsolete and worn machines and tools replaced from the government's surplus becoming an opportunity for speculators and a threat to established business. Equipment from government stockpiles of surplus war machinery will be sold for replacement only on condition that equipment replaced is destroyed.

Howe estimates that about 30 percent of Canada's $10,000,000,000 war output will be available for disposal as surplus war assets. Included in this are materiel supplied United Nations countries as mutual aid, and returnable to Canadian ownership if still in existence at war end, and recoverable equipment of Canadian forces.

Carry Out Government Policy

The Dominion's war assets disposal policy, as far as it has been defined, and the administrative machinery for carrying it out, remain unchanged in legislation now before parliament to make the disposal setup permanent and give it statutory authority. Surplus crown assets bill makes Howe a dictator of disposal. The present crown assets allocations committee will advise him and War Assets Corporation will be the active administrator. President of the corporation is J. B. Carswell, formerly head of the Washington branch of the Canadian Munitions and Supply Department. Most of the directors are outstanding businessmen.

In the last two months sales of machine tools have amounted to less than $25,000. A few thousand dollars worth of scrap metal has been sold. Some used trainer planes which cost between $6,000 and $7,000 have been sold to Mexico for about $1,500 "as is and where is." A small quantity of automotive equipment has been sold.

Names in the News

Samuel J. Kornhauser, executive vice president, National Tool Co., has been elected president of the firm to succeed the late **Arthur J. Brandt.**

J. E. Donnellan

J. Edward Donnellan has resigned from the American Society for Metals to join the General Alloys Company as vice president in charge of sales. Mr. Donnellan has been associated wtih the metal industry for many years and has been connected with the New Departure Manufacturing Co., the United States Naval Experiment Station and the Halcomb Steel Co. He was the editor for six editions of the nationally known *Metals Handbook.*

Quaker Chemical Products Corp., Conshohocken, Pa., has added four men, **Stanley Brink, Burdette F. Wilson, J. D. Neville** and **J. H. Lightner,** to its staff of field engineers.

Myron L. Gordon, vice president and general manager of the Wright Aeronautical Corp., Paterson, N. J., has resigned and will be succeeded by **G. M. Williams,** senior vice president of the Curtiss-Wright Corp., in the direction of the engine company's activities.

R. C. Henshaw has been promoted to chief engineer in charge of all product design and development for the Lord Manufacturing Co., Erie, Pa., while **Paul C. Roche** has been named chief field engineer. **Leon Wallerstein, Jr.** has been appointed to the post of development engineer of the company and will have complete charge of the development laboratory.

V. H. Hiermeier has been named industrial manager of the St. Louis office of the Brown Instrument Co. to succeed **I. K. Farley.** Mr. Hiermeier has had 15 years' experience in the industrial instrument field and for the past few years has been in the Chicago office of the Brown Co.

John A. Faler, assistant chief engineer of the Detrex Corp., Detroit, Mich. has been appointed to take charge of extraction equipment development, while **Thomas J. Kearney,** who has been with the company for 10 years, has been named assistant chief engineer in charge of industrial equipment design and detailing.

C. H. Lage has been appointed general works manager of LaPlant-Choate Manufacturing Co., Cedar Rapids, Iowa. Mr. Lage was formerly vice president in charge of manufacturing for the Universal Unit Power Shovel Corp., Milwaukee, Wis. and works manager of the Davis Thompson Co.

R. T. Dunlap, former vice president and general superintendent of the Buffalo district has been named vice president in charge of production, Wickwire Spencer Steel Co., New York. **A. G. Bussmann** has been appointed assistant to the president, E. P. Holder. Mr. Bussman has been with Wickwire Spencer since 1930 and during that time has been assistant to the executive vice president of the company.

R. T. Dunlap

C. O. Drayton

Charles O. Drayton, former general sales manager of the American Screw Co., Providence, R. I., has been elected vice president in charge of sales for that company. **George H. Reama** was elected vice president in charge of manufacturing at the same time. Mr. Reama was formerly factory manager.

A. S. Shoffstall

Arthur S. Shoffstall, general manager of the International Nickel Company's Huntington works, has retired from that position, effective June 30. He will be succeeded by **Herman N. Brown,** assistant general manager for the company since 1921. Mr. Shoffstall, who has been with the company since 1908, will continue in the capacity of a consultant to the head office.

Harold J. Ritter has resigned as vice president and director of the Norma-Hoffmann Bearings Corp., effective June 30.

Walter L. Maxson, former manager and chief engineer of the mining division of Allis-Chalmers Mfg. Co., has been appointed director of research for the Oliver Iron Mining Co., Duluth, Minn., a U. S. Steel subsidiary.

George H. Compter has been appointed a staff engineer in the aeronautics division of the Society of Automotive Engineers.

Harry A. Fennerty has been elected president of the Alliance Machine Co., Alliance, Ohio, to succeed the late **W. H. Purcell.** Other officers elected at the same time include: **G. W. Shem,** director and president of the Alliance Structural Steel Co., chairman of the board, and **R. J. Harry,** vice president.

C. P. Croco has been appointed manager of the newly-formed welding department of the Motor Div. at the Tafford, Pa. works of Westinghouse Electric & Mfg. Co.

BUSINESS ITEMS

Barber-Colman Co. has established an office for service and sales purposes at 832 West Fifth St., Los Angeles, Calif., with **Roy H. Jones** as direct representative for their line of hobs, milling cutters and reamers in the Los Angeles area.

The recently formed **Northrop-Hendy Co.,** jointly owned by **Northrop Aircraft, Inc.** and the **Joshua Hendy Iron Works,** has moved to new quarters on the Northrop grounds provided by the **Defense Plant Corp.**

Martial & Scull, industrial designers, have moved from 1220 Broadway to enlarged quarters at 1 East 53 St., New York. Four new associates, **Charles H. Lango, Roland Bolton, Herbert Tannebaum** and **Robert H. Simpson,** have been added to the engineering and designing staff of the concern.

The Carborundum Co. of Niagara Falls, N. Y., has opened three new branch sales offices in Buffalo, N. Y., St. Louis, Mo., and San Francisco, Calif., with **G. S. Rogers, Gordon O. Watson** and **W. T. McCargo** in charge of the respective offices.

Jones & Laughlin Steel Barrel Co., a subsidiary of **Jones & Laughlin Steel Corp.,** has purchased the physical assets and business of the **Draper Manufacturing Co.,** Cleveland. The Draper Div. will be operated under the present managing personnel.

Resin Industries of Santa Barbara, Calif., has been formed to serve the West Coast in the field of synthetic elastimers. The company will provide engineering and production service to aircraft, shipbuilding and allied industries.

The Morse Twist Drill & Machine Co. of New Bedford, Mass., has opened a Pacific coast store at 1180 Folsom St., San Francisco 3, Calif., where they plan to carry a representative stock of their small tools to supplement distributors' stocks and to care for emergency orders.

Worthington Pump & Machinery Corp., Harrison, N. J., has purchased **Electric Machinery Manufacturing Co.,** Minneapolis, Minn. Operation of Electric Machinery will continue independently of the other Worthington interests and they will continue in the production of their main lines.

Cutler-Hammer, Inc., Milwaukee, Wis., has opened a drive-in warehouse at 1200 Walnut St., Cincinnati, Ohio, where a complete stock of the company's electrical controllers for industrial, commercial and domestic needs will be carried. This warehouse is under the management of **E. C. Bolton.**

George Keller Machinery Co., Buffalo, N. Y., has been appointed exclusive distributor for western New York of RTD thread rolling dies and Reed cylindrical die thread rollers, produced by **Rolled Thread Die Co.,** Worcester, Mass., The **C. H. Briggs Machine Tool Co.,** Syracuse, N. Y., has been appointed distributor for these products in central New York and northern Pennsylvania.

Perfex Gage & Tool Co., 3603 Gaylord Ave., Detroit, Mich., has appointed **Gilbert Morgan** as their representative in the Chicago territory with offices located at 30 N. LaSalle St., Chicago, Ill.

The Bunting Brass & Bronze Co. has appointed Frank J. Brogan as special sales representative for that company in Texas, Okla., Ark. and La., with headquarters in Dallas.

The Reading Chain and Block Corp., Reading, Pa., has appointed several representatives responsible for sales through distributors. The agent in N. C., S. C., Va., Ga., La., Fla., Ala., Miss., Tenn. and Ark., is **J. R. Kindig** of Atlanta, Ga. In N. Y. and N. J., **Dunn & Bryan** are the new agents while the **Transmission Engineering Co.** represents them in So. Calif., N. M., Ariz. and So. Nev., with the **Alaska Junk Co.** for the state of Ore.

The mechanical division of **General Mills, Inc.,** has been established as a full-fledged operating division. At present it is occupied in ordnance production, but in the postwar period the division will produce precision devices and mechanical products under the company's name.

The offices and laboratories of **Sam Tour & Co., Inc.,** are now located in their building at 44 Trinity Pl., New York 6, N. Y.

OBITUARIES

H. C. Atkins

H. C. Atkins, Sr., son of E. C. Atkins, the founder of E. C. Atkins & Co., passed away June 15 following a lengthy illness. In 1889 he became superintendent of the E. C. Atkins & Co. plant and in 1892 was elected vice president of the company. In 1901 he was elected president of the firm and retained that position until his death. Mr. Atkins was a member of the board of directors of the National Association of Manufacturers.

William C. Reilly, retired vice president of the Youngstown Sheet and Tube Co., Youngstown, Ohio, passed away June 20 at the age of 76, having been associated with the steel industry for over 60 years.

W. H. Purcell, founder and president of the Alliance Machine Co., Alliance, Ohio, died recently at the age of 80. He was one of the founders of Machined Steel Castings Co., the Alliance Structural Co. and the Alliance Mfg. Co.

Oliver W. Spencer, vice president of the Southern Wheel Co., New York, since 1939, died recently at the age of 52.

Lord Herbert Andrew Montagu-Douglas-Scott passed away June 17 at the age of 71. He was the chairman of Rolls-Royce Ltd. and president of British Industries in 1934-35.

Archie D. Wilson, 53, production engineer, died recently at his home in Cleveland. For the past three years, Mr. Wilson has been in charge of the Osborn Manufacturing Company's brush plant in Cleveland.

MEETINGS

American Institute of Electrical Engineers. Pacific Coast Technical Meeting. Biltmore Hotel, Los Angeles, Calif. August 29-Sept. 1.

Silver Bay Association. Silver Bay Industrial Conference. Lake George, N. Y. July 26-29.

Society of Automotive Engineers. National Tractor Meeting. Schroeder Hotel, Milwaukee, Wis. Sept. 13-15.

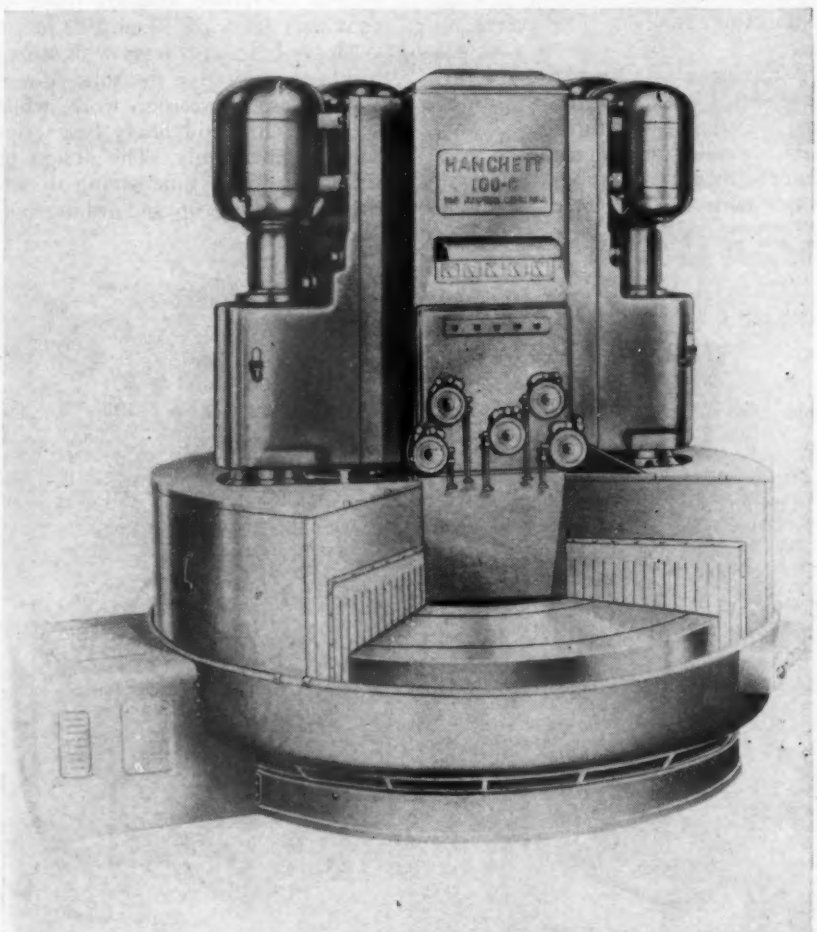
Shop Equipment News

Hanchett Model 100 Five-Spindle Surface Grinder Provides Total of 200 Hp. for Grinding Wheels

Greater grinding capacity is offered in the No. 100 five-spindle surface grinder now being introduced by Hanchett Manufacturing Company, Big Rapids, Mich. In a recent test, this machine removed stock at a rate of eight cubic in. per min. from cast iron cylinder blocks.

The No. 100 has a T-slotted work table 100 in. in diameter, 20 in. wide, driven through a P.I.V. variable speed unit by a 5 hp., 1,200 rpm. motor. Each of its five grinding wheel heads has a 40 hp., 900 rpm. motor. Each head has an automatic sizing device, which automatically compensate for wheel wear and operates in increments of 0.0002 in. The first three—stock removing—wheels are usually coarse grain; the fourth wheel medium fine, and the fifth, or finishing wheel, of a rather fine grain.

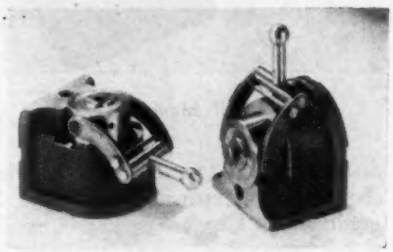
Each wheel head has a wheel dresser and a built-in ammeter so that wheel action can be observed. Unit weight is about 55,000 lb.



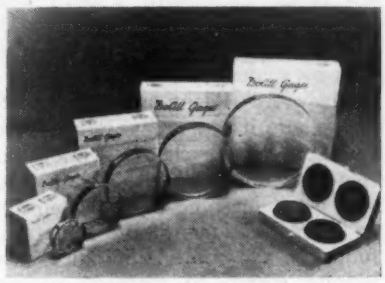
Hanchett No. 100 surface grinder

Zagar V-H Holding Fixture Chucks Work in Two Planes

A holding fixture, developed by Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio, possesses all the basic advantages of standard chucking tools and has the added ability to function either horizontally or vertically. The body is of cast Meehanite and has two right-angled faces milled with key slots in two directions on each face, adapted to any position on a drill press or milling machine. Cutting oil forced via tapped hole through fixture lubricates work, flushes chips. No angle plates are required.



Zagar V-H holding fixture

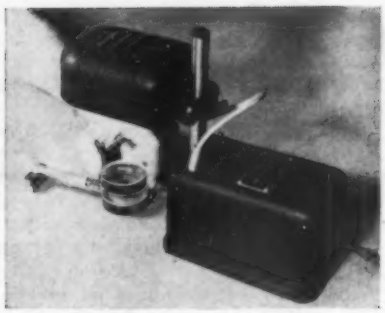


DoAll optical flats

DoAll Has Optical Flats and Light Source for Inspection

Two developments of Continental Machines, Inc., 1301 Washington Ave., S., Minneapolis 4, Minn., for precision measurement are used in conjunction with each other. DoAll optical flats, made from fused Brazilian quartz, are used with light rays from a monochromatic light. This latter is provided by the DoAll Monolight, the second development, which uses helium light rays. The devices are used to check master flats, flat surfaces of gages, machine parts, anvils of micrometers, and comparators and steel bars.

The optical flats, available in six sizes 2, 3, 4, 5, 6 and 10 in. in

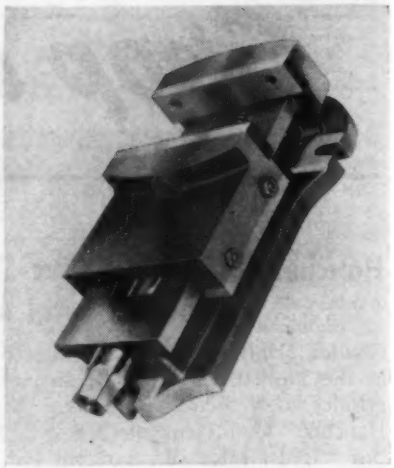


DoAll Monolight

diameter, are harder and have a lower coefficient of expansion than optical grade glass. They are packed in hardwood cases, and each flat carries a marked accuracy guarantee showing variance in absolute flatness. Available grades of accuracy are: one millionth accuracy, for laboratory gage block and instrument inspection, and two millionths, for checking instruments and fine tools.

Helium is used in the Monolight because it is obtained in a highly purified form, one wave length only and as it had a distinguishable yellow color. Light is high in intensity making it easier to distinguish the wave unit known as the "fringe" or interference band. Rays from the light when viewed through optical flats produce interference bands of 11.6 micro inches. These bands are used to measure flatness, height and parallelism.

Capacities of the Monolight are: maximum height, lamp to table, 12 in.; minimum height, 8½ in.; projection head tilts, 90 deg. up and 21 deg. down; rotates 360 deg. The projection head is removable for inspection in hand, weighs 12 lb., and operates on 110 volt 60 cycle, single phase, current.



Rouselle victory vise

Rouselle Victory Precision Vises Come in Four Sizes

Four heavy stationary vises have been added to the line of Rouselle victory vises produced by the David J. Ross Company, Benton Harbor, Mich. These vises were designed to meet war-time production demands for heavy, accurate vises to hold work during milling, grinding, cutting and similar operations and are made in four sizes—4½, 7, 10, and 13 in.

Heavy bases and ways with strong locking screws give the solidity necessary in such precision work, while the long, low and heavy base grips the machine firmly. The design of the vise permits time saving in setting-up, locking up and fishing out.

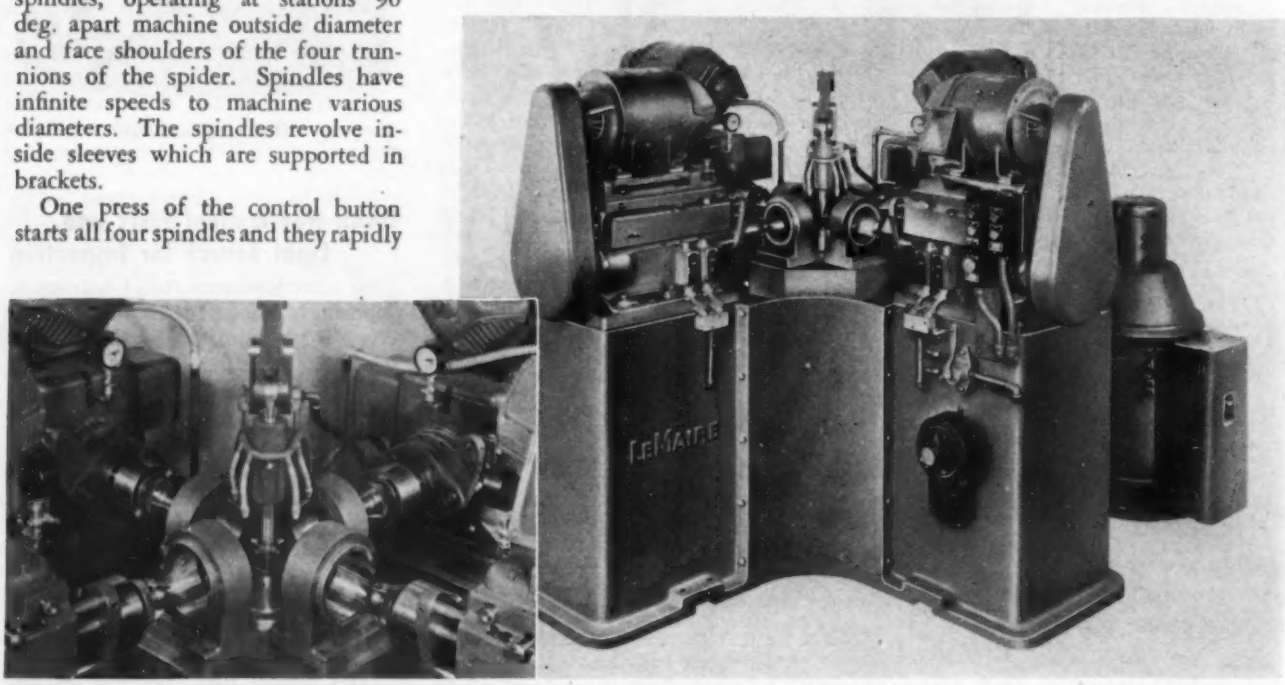
LeMaire Combines Four Standard Hydraulic Units To Hollow Mill and Face Universal Joint Spiders

A four way universal machine for hollow milling and facing universal joint spinders has been made by LeMaire Tool & Mfg. Company, Dearborn, Mich., by combining for standard bases, each with a twin ram hydraulic unit, to a special center base. Production varies according to sizes of spiders machined.

The piece is laid on a center fixture where it is automatically locked and held by air clamps while four spindles, operating at stations 90 deg. apart machine outside diameter and face shoulders of the four trunnions of the spider. Spindles have infinite speeds to machine various diameters. The spindles revolve inside sleeves which are supported in brackets.

One press of the control button starts all four spindles and they rapidly advance simultaneously, followed by feed, dwell, and rapid return. On a ⅝ in. diameter trunnion, ⅝ in. long, production is about 150 pieces an hour.

The same machine can be arranged for boring, drilling, reaming and, in some cases, threading. Too, each spindle can be made to perform different operations, using an index table in the center.



LeMaire four-way milling and facing machine

"You can do it with a DUOMATIC"

TO CUT FROM ANY ANGLE – FRONT OR REAR . . .
. . . JUST SWIVEL THE TOOL SLIDES!
INNER BEARING RACE being machined with one tool front and two tools rear.
ROCK BIT CONE machined with six tools front and six tools rear.
RING GEAR machined with four tools front, three tools rear, and one tool on overhead attachment.

ENGINE
AUTOMATIC
TOOL ROOM
OIL COUNTRY
LATHES

To obtain unlimited cutting angles on the Lodge & Shipley Duomatic Lathe, only the simplest adjustments are required. With the dual carriages and tool slides—front and rear—multiple tools are used in turning and in straight and angular facing operations never before possible with so little effort. The most difficult bevel cuts are performed with remarkable ease.

The massive tool slides of the Duomatic are solidly supported, insuring stability even under heaviest cuts, and are readily swiveled to give a power feed and power traverse movement at any angle. When the tool slide is rotated through an angle of 180°, the direction of feed motion is reversed so that facing cuts travel away as well as toward the centerline.

These outstanding improvements, greatly widening the range of cutting operations, are typical of the many time-saving, labor-saving advantages offered in the Duomatic. As a result, the Duomatic stands unchallenged among automatic lathes for simplicity and adaptability, handling large or small lots with equal facility. For more detailed information, call on Lodge & Shipley Engineers or write on your company's letterhead for Bulletin 601-FL.

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

Reimuller Hydraulic Vise Can Be Used Vertically

The Reimuller V-way vise, manufactured by Reimuller Bros. Company, 9400 Belmont Ave., Franklin Park, Ill., can also be mounted vertically and used as a production press on small precision upsetting, heading and other operations. The vise is operated through a foot control.

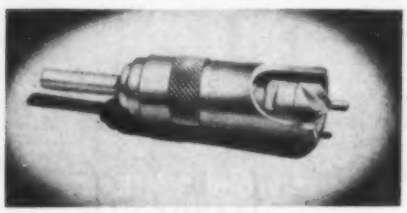
Only two levers are used in the hydraulic control; one to apply pressure up to rated tonnage; the other for release. No outside airlines or power is needed and the unit is self air-eliminating. The vise is portable, in that it has flexible hydraulic base, which makes possible adapting the unit to various machines. Two sizes are available: 4 ton with 4 in. opening, and 7 ton with 7 in. opening.

Reimuller hydraulic vise

Aircraft Tools Countersink Features a Cutaway Skirt

Model 400-A countersink made by Aircraft Tools, Inc., 750 East Gage, Los Angeles 1, Calif., is a lightweight, compact unit which includes only one-third the parts usually found in countersinks and features a cutaway skirt which permits countersinking of holes in close quarters.

Other features include a type of construction that is vibration-proof and which may be disassembled or reassembled in sixty seconds without use of special tools, a permanent lubrication reservoir, and adjustment in increments of 0.002 in.

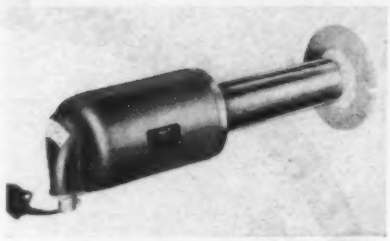


Aircraft Tools countersink

Pope 6X18 in. Grinder Spindle Has Full Sealed Construction

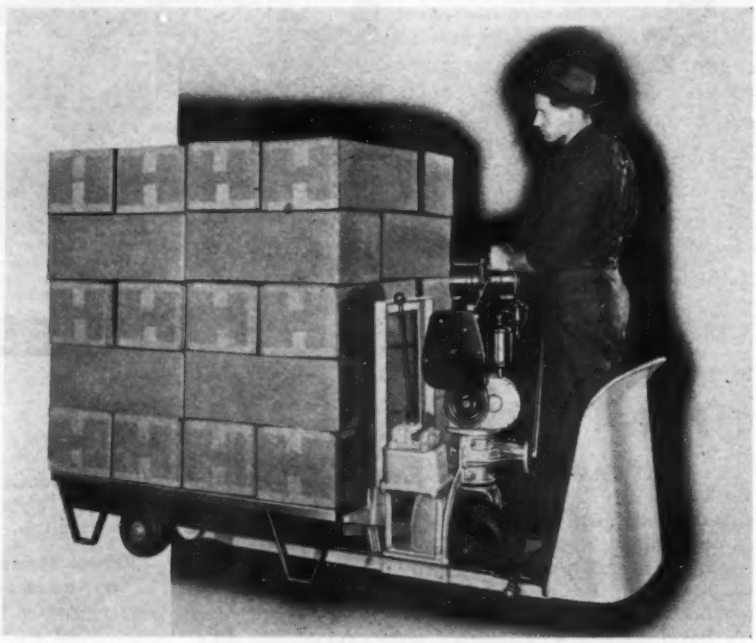
The motorized grinding spindle for 6 × 18 in. grinders, made by Pope Machinery Corporation, Haverhill, Mass., is completely enclosed, there being no openings for air, lubrication, or adjustment. Operation is uniformly efficient throughout the life of its bearings.

This spindle operates horizontally, vertically or at any desired angle. The solid shaft extension is readily varied for mounting special tool holders or standard drill chucks. It is used regularly on 6 × 18-in. surface grinders and can also be used on boring mills, planers and other tools for special work. It is equipped with super-precision bearings



Pope motorized grinder spindle

Truck-Man, With Capacity of One Ton, Features Two-Speed Drive for Varying Load Conditions



Truck-Man shop truck

The Truck-Man, offered by Yard-Man, Inc., Jackson 48, Mich., has been designed to move skidded loads of one ton or under in a safe and efficient manner.

One of the most important improvements, according to the manufacturer, is a patented two-speed drive which makes both a low and speed drive immediately available. The low speed is adapted for starting, climbing ramps, going in and out of freight cars and other tight places, and for moving material over rough floors, while the high speed is preferable for light loads or movement without loads. It can turn around in its own length.

The steering has been improved by the use of a large ball thrust bearing; the seat not only serves its purpose when the driver is seated, but is useful as a support when the driver is standing; and a larger gas tank has been added with a capacity of one gallon, which will provide sufficient fuel for eight hours of normal operation.

DIMENSIONAL ACCURACY { ONE OF THE 5 THINGS TO LOOK FOR WHEN YOU BUY GAGE BLOCKS

Look for these 5 things when you buy Gage Blocks –

1. Dimensional Accuracy
2. Stability
3. Surface Finish
4. Wearing Quality
5. Service after the sale

The first requirement of gage blocks is that the surfaces are absolutely flat —opposed surfaces are parallel and all surfaces are accurate to sizes indicated on the blocks.

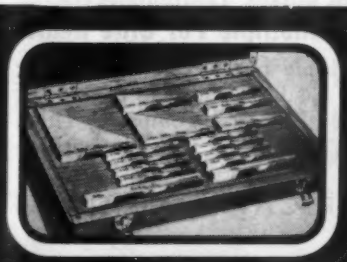
Every Webber Gage Block is subjected to an exhaustive series of tests and inspections which guarantee that all requirements of dimensional accuracy are met.

To further assure the ultimate accuracy of these blocks, the final tests are made in air conditioned, temperature-controlled rooms.

It is this faithful attention to minute details—a thorough knowledge of gage block manufacture gained through long years of experience that enables Webber to produce, in quantity, gage blocks of dependable dimensional accuracy.

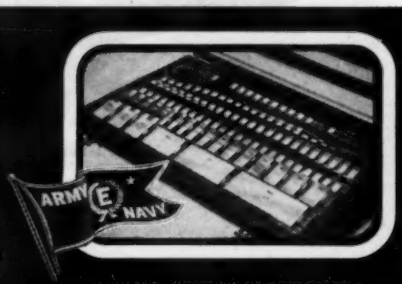
Webber Gage Block Sets are available in the following range of sizes:

Set No. 84A	$350.00
Set No. 84B	$235.00
Set No. 43A	$185.00
Set No. 43B	$150.00
Set No. 38A (Thin Blocks)	$195.00
Set No. 38B (Thin Blocks)	$155.00
Set No. 14A (Angle Blocks)	$450.00



Webber GAGE COMPANY

12901 TRISKETT RD. • CLEVELAND 11, OHIO



Stellite Round Tool Bits Furnished in Two Grades

Round tool bits, made from Stellite 98M2 or Stellite Star J metal alloy, are now furnished by Haynes Stellite Company, unit of Union Carbide and Carbon Corp., Kokomo, Ind. The round tool bits are furnished centerless-ground to tolerances of plus zero and minus 0.002 in. on the diameter and plus or minus 1/16 in. on the length. They are designed for use on turning or boring operations or can be ground into drills or reamers.

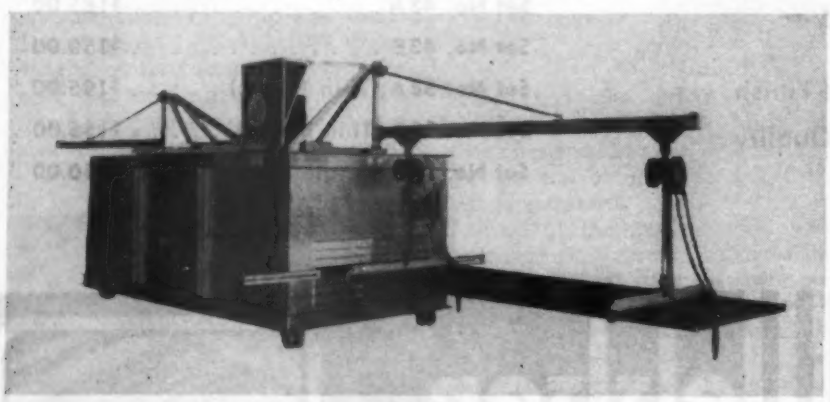
Knapp-Lee Builds Furnace For Long Magnesium Sheets

A capacity of seven sheets of magnesium alloy up to 4 ft. wide, 12 ft. long and ¼ in. thick is provided in the Knapp-Lee 600 F. magnesium preheat furnace made by James H. Knapp Co., 4920 Lorna Vista Ave., Los Angeles 11, Calif. The furnace is self-contained and mounted on double casters for movement to presses where the magnesium is to be hot formed.

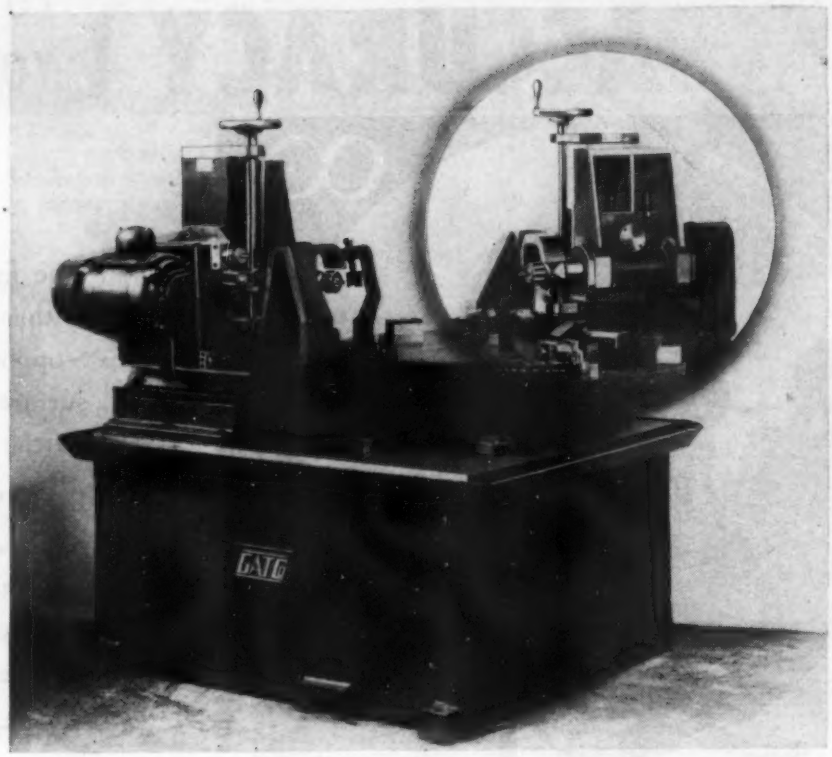
Loading and unloading can be done through seven double doors on either end of the furnace. At the furnace ends, jib booms with chain hoists handle the hot tray loads. When not in use the booms fold back over the furnace.

The furnace is electrically heated and equipped with three blowers on one shaft. Heating elements are in the plenum chamber in front of the blowers and extend the full furnace length. Recording controls cause heat input to be reduced during the soaking period or for low temperature operation.

With booms folded, furnace dimensions are 9 × 9 × 17 ft. long: overall length with booms extended is 38 ft.



Knapp-Lee magnesium preheat furnace



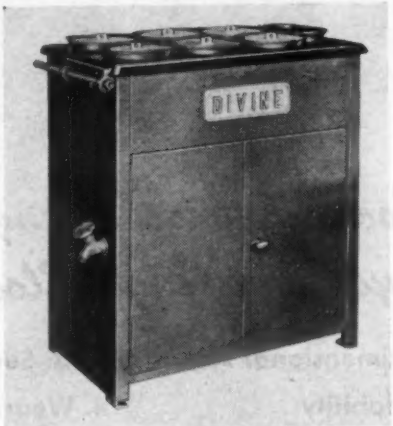
Gatco portable miller mounted on a base

Gatco Makes Portable Miller Available Right- or Left-Hand

Jobs which are impractical to handle on standard machines are suited to the portable Gatco milling machine being manufactured by Giern & Anholtt Co., 1308 Mt. Elliott Ave., Detroit 7, Mich. The unit, available right- or left-hand, is entirely self-contained with power unit and feeds.

The vertical working stroke is from 0 to 3.5 in. The stroke is achieved through a reciprocating motion actuated by worm gearing fitted into spindle. The spindle travel has equal speed in either direction. Horizontally, the depth of cut is from 0 to 2.5 in., with change in range made through an adjustable stop at the rear of the slide.

Ratchet feed is adjustable to provide feed of from 0.002 to 0.009 in. at each end of the stroke. The spindle is driven by a 1 hp. motor, with speeds suitable for end mills from 3/16 to ½ in. diameter. The spindle nose collet is standard.



Divine thermo-electric glue heater

Divine Makes Thermo-Electric Multiple Pot Glue Heater

A multiple pot thermo-electric glue heater has been added to the line of Divine Brothers Company, Utica, N. Y. Use of a multiple pot sys-

PWC Motorized Storage Battery Welder designed for (approved) welding of up to 0.064" aluminum (heavier gages in tack-welding) sub-assemblies in large fixtures. Eliminates lofting of holes, use of temporary clamps and uncertainty of alignment. Costs less than other stored-energy types.

A cable this size

supplies all the power needed to Weld Aluminum with the New P.W.C.

PORTABLE STORAGE BATTERY WELDER

Costs less than other types of stored energy welders yet is as simple to operate and maintain as an industrial truck. Requires only enough 3-phase 220/440 volt line power to operate a simple battery charger. Yet is capable of making practically any conceivable resistance weld (25000 amps in installation shown). Its simplicity of control eliminates need for highly trained technicians. Any good mechanic can understand a battery welder.

WHY STORAGE BATTERY WELDING: The idea of using batteries for welding is old but was not practical heretofore. It was made possible by the new PWC contactor, which reduces welding current to practically "zero" from 1000s of amperes just prior to interruption, (eliminates arcing). Simple sliding rheostat adjusts welding current. Adjustment is less critical than with other types of welders.

STORAGE BATTERY WELDING IS SUITABLE FOR: any form of resistance welding, (gun welders, pedestal welders, projection, seam and butt welders). Ask for Pictorial No. 37.

PROGRESSIVE WELDER CO.

SEAM PROJECTION & BUTT • *Electric Welding Equipment* • PORTABLE GUN & PEDESTAL

3050 E. OUTER DRIVE • DETROIT 12, U. S. A.

tem, according to the manufacturer's announcement: makes fresh, strong glue available at all times; wheel heads last longer, polish more pieces per head, due to use of fresh glue; a separate pot for each grain size prevents mixing coarse with fine grains; pot covers keep the heating glue clean, keep water tank hot when pots are removed and prevent forming of glue scum; polished aluminum or spun copper glue pots fitted with lifting handles, facilitate fast cleaning; glue density is controlled by use of glueometer and dippers.

Models are available with 4, 6, 8, 10 or 12 pots and with 2, 3 or 4 elements, other models available are steam or illuminating gas heated. Large water tanks circulate abundant water around pots, to keep temperature even.

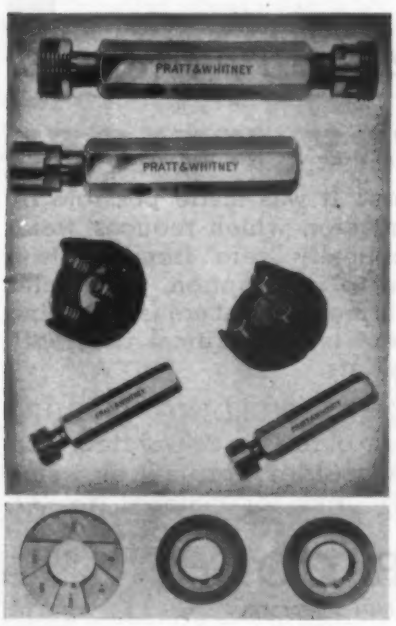
Pratt & Whitney Has Complete Series of ANPT Thread Gages

Army and Navy specifications in aeronautical pipe threads are met by a new line of gages offered by Pratt & Whitney, Division Niles-Bement-Pond Company, W. Hartford, Conn. These gages will check for adherence to joint specifications known as Spec. AN-666-P-363, Amendment #2.

For internal threads there is a double-edge gage carrying the L1 and L3 thread plug gages which check lead, form, diameter and taper. These are followed by plain taper plug gages which check taper, roundness and minor diameter. The L1 and L3 plugs have three steps for classifying the thread, while the plain taper plug has six.

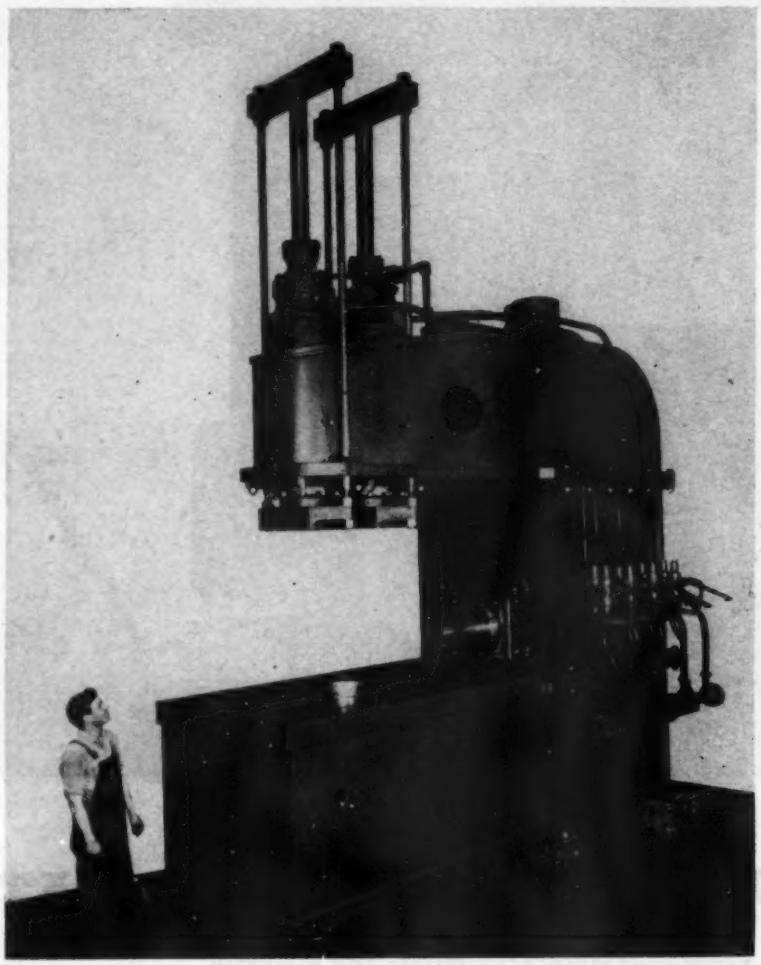
For external threads, Pratt & Whitney has a set of two special ANPT Tri-Rod gages. The first is a thread gage which checks lead, form, taper and pitch diameter. Three steps on the top of the gage classify the thread. The second is a plain taper Tri-Roll gage for checking taper and diameter of threads at crest. This has a stepped plunger and three steps on bottom of gage for easily classifying thread. A setting plug is furnished with each.

An alternative method of checking external threads is provided through a set of three ring gages, which Pratt & Whitney can also supply.



Pratt & Whitney thread gages

Wood Company Sectional Flange Press Has Two 150-Ton Main Rams, Stripper and Horizontal Rams

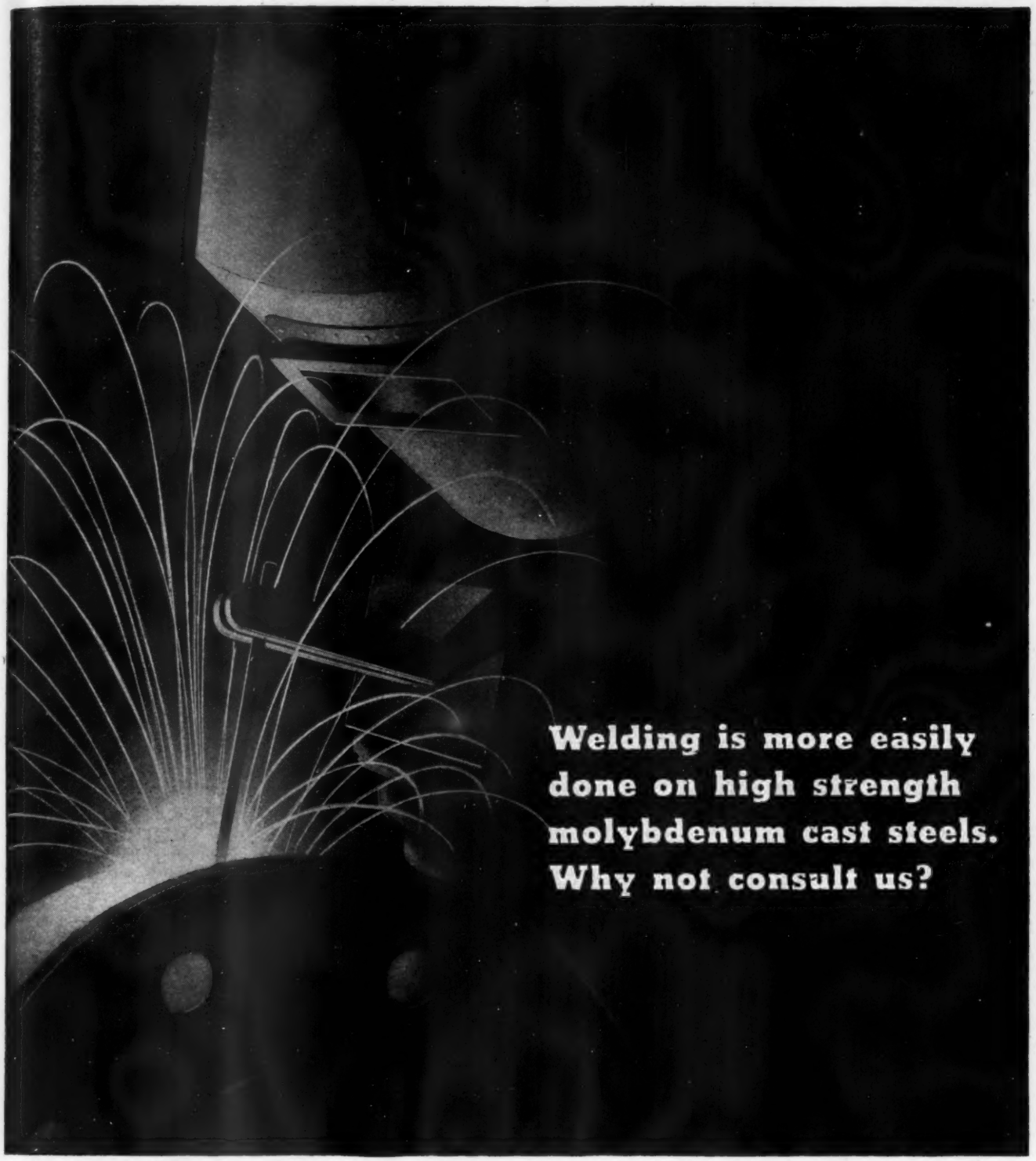


Wood sectional flanging press

R. D. Wood Co., Philadelphia 5, Pa., has developed a hydraulic sectional flanging press designed to provide 1,500 psi. working pressure. Full stress of the working load is carried by two 10-in. tension columns, contained in the machine frame.

There are two 16 ¾-in. diameter vertical main rams; a 14-in. stripper ram and a 15½-in. double acting horizontal ram. Travel of the main rams is 30 in. and each has 150 tons capacity. All operating valves are arranged in pulpit form to permit operating each of the main rams separately, or both rams together. The latter combination gives a total capacity of 300 tons.

Horizontal and stripper rams have 24-in. strokes and each has a capacity of 115 tons. Maximum daylight opening is 45 in.; width of table 8 ft. The table has four T-slots, running from front to back, and is machined for insertion of a stripper cylinder.



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue · New York City

MOLY

Scherr Opti-Flat Master Plate Is Accurate to 0.000050 Inch

The Opti-Flat, an optically polished glass master surface plate, said to be accurate to 0.000050 in., is being offered by The George Scherr

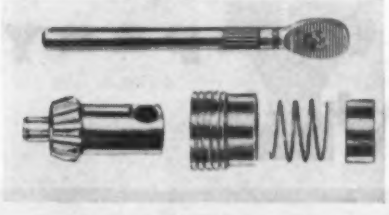
Scherr Opti-Flat surface plate

Company, 200 Lafayette St., New York 12, N. Y. They are resistant to abrasive and are made 2 in. thick in the 12-in. size and 3 in. thick in the 16-in. size to prevent warpage and breakage. The plates are inspected by optical flats and are strain annealed and will not distort, according to the maker.

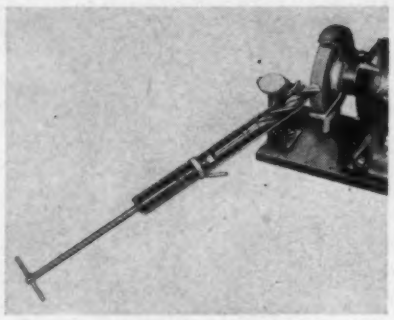
Safety Kee-Jector For Lathe or Drill Chuck Key

A safety device, the Kee-Jector, has been developed by the Safety-Specialties, 3229 N. E. 7th Street, Portland, Ore., for application on standard lathe or drill press chuck key.

The Kee-Jector is made in a complete range of sizes and fits as a guard on the chuck key of any size drill press or lathe and ejects the chuck key the moment the drill or lathe is tightened, thus preventing accidents which occur when the operator forgets to remove the chuck key before turning the power on. The device does not hinder proper key use.



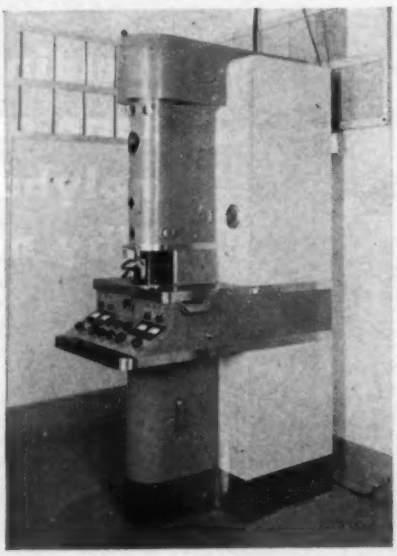
Safety-Specialties Kee-Jector



Majestic drill sharpener

Majestic Drill Sharpener Set by Instruction Dial

Majestic Drill Sharpener Company, 1100 2nd Avenue So., Minneapolis 2, Minn., has developed a sharpener which can be attached to any grinder. An integral part of the unit is an instruction dial which is set for the size of drill being sharpened. Setting the dial makes all necessary adjustments. It will handle straight or No. 2 taper shank drills in sizes ranging from 5/32 to 1 in. diameter.



R.C.A. electron microscope

RCA Electron Microscope Available for Small Jobs

A console size electron microscope has been developed by RCA Victor Division, Radio Corporation of America, Camden, N. J., in order that this type instrument may be available for small industrial laboratories. The electron microscope makes possible useful magnifications up to 100,000 times the size of the object being studied.

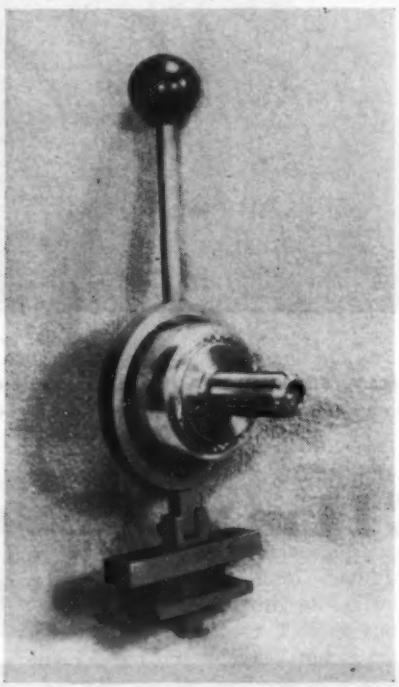
In the industrial field the instrument is expected to find considerable use in connection with metallurgical studies of ores and the surface structure of metals.

The console model requires 15 electronic tubes, ten less than the large universal unit. This difference results from the elimination of the diffraction camera unit. An electron beam passing through a specimen is affected by density and composition of various parts of the specimen. When it emerges from the far side of the object, the beam bears the image's pattern, magnified as much as 20,000 times. Power may be derived from an ordinary household electric socket.

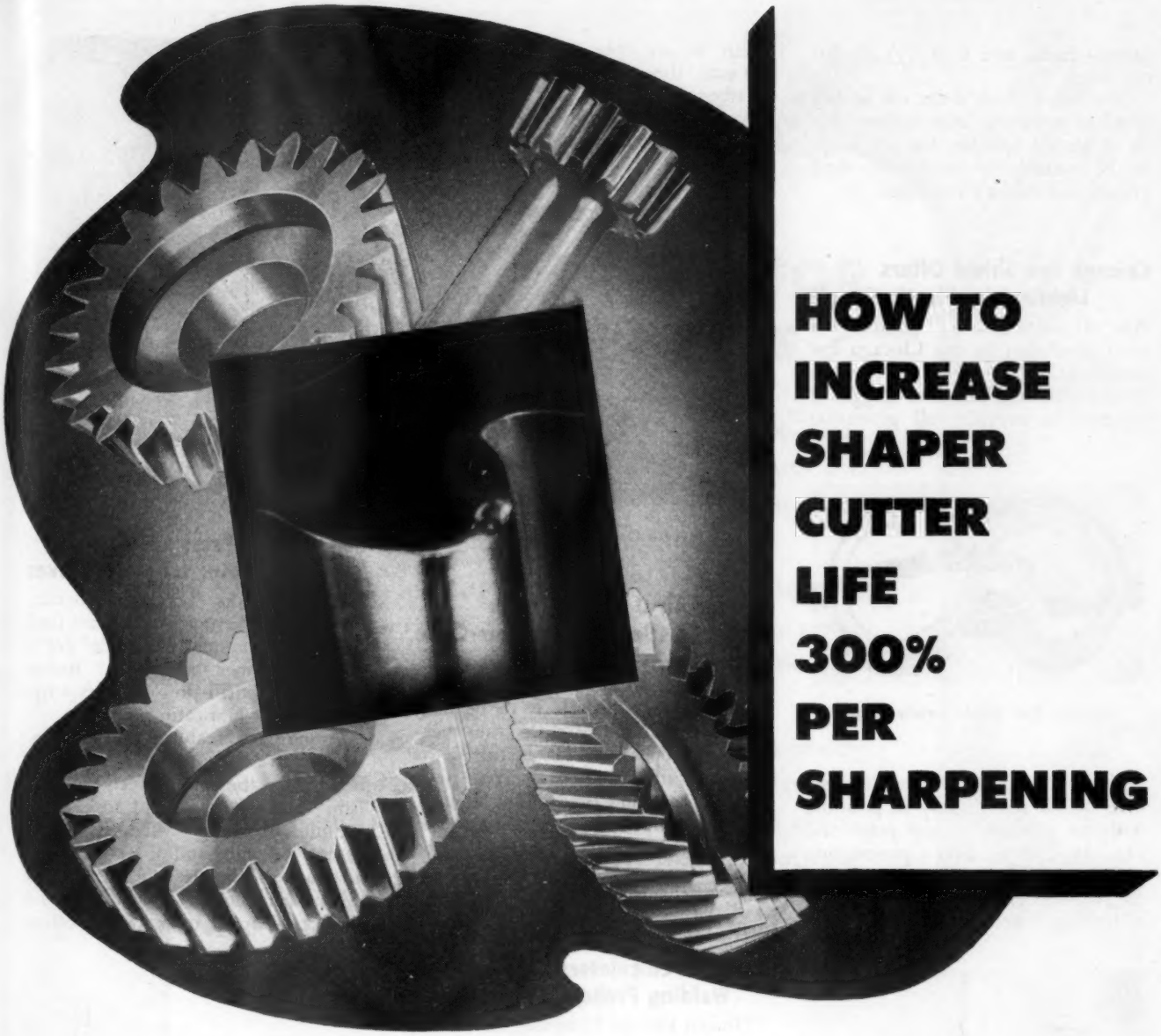
Otsega Lathe Speed Chuck Features Expanding Arbor

The Otsega speed chuck, offered by Morrison Holmes Co., 414 Curtis Bldg., Detroit 2, Mich., is available in two sizes; the junior with 1/8- to 7/8-in. collet capacity, and the senior with collet range from 7/8 to 2 in. With this chuck it is not necessary to stop the machine to insert or remove work.

Gripping power of the lathe is adjustable so an extra firm grip can be provided for holding work on which heavy operations are to be performed and a light grip can be used on thin walled tubing. An expanding arbor is available which provides a quick conversion from 0D to 1D holding. Arbor sizes are available in 1/2 to 2 1/2 in. sizes for the



Otsega speed chuck



HOW TO INCREASE SHAPER CUTTER LIFE 300% PER SHARPENING

One of the simplest methods of increasing the life of shaper cutters is to protect the cutter against nicks like the one above. Normal amount of stock removal to sharpen a Michigan shaper cutter is only around 0.007 inches on the average. A nick like this one may mean the necessity of removing .025 to .030 inches of metal to resharpen the tool. The potential output of the tool for three additional sharpenings has thus been wasted.

While nicks in gear cutting tools may be caused by a variety of reasons, the most prevalent one is carelessness in handling. The very hardness which gives Michigan gear cutting tools their outstanding performance means that such tools require careful handling to prevent chipping, nicking or breakage. Extensive field investigation has revealed that in 4 out of 5 cases of damaged tools, the damage is due to incorrect or careless tool handling to and from machines, in the store-room, in sharpening (sharpening heat-checks which later result in tool failure), etc.

Do you have a copy of "Shaping"? Ask for Bulletin GS-42.

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD . . DETROIT 12, U. S. A.

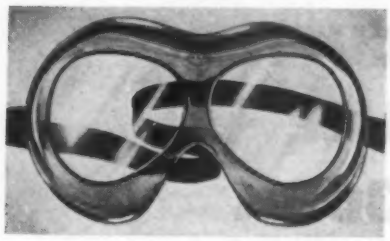
BUY U.S. BONDS STAMPS

junior chuck, and 1 to 4½ in. for the large.

The speed chuck is for use on any speed or polishing lathe having 1½-in. 8 thread spindle, but an adapter is available to use it with drill presses and milling machines.

Chicago Eye Shield Offers Lightweight Plastic Goggle

An all-plastic safety goggle has been developed by the Chicago Eye Shield Company, 2300 Warren Blvd., Chicago, Ill. The goggle is reported to provide full protection



Chicago Eye Shield safety goggle

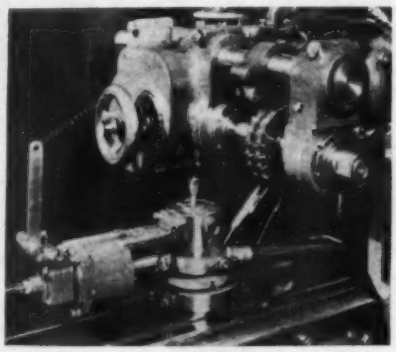
against impact, yet it weighs only 0.96 oz. It rests lightly in position, with no pressure at any point and can be worn over prescription glasses. Sufficient air space prevents fogging and provides a shield against distracting reflections and eye strain.

Barentzen height gage adapter

Barentzen Height Gage Adapter Provides for Direct Readings

Barentzen Products, 521 Fifth Ave., New York 17, N. Y., is marketing an adapter, for use on conventional height gages, that provides for direct readings from the nearest inch. Replacing the clamp on the gage arm, it becomes an adjustable arm.

In use, the gage reading is set to zero or an even inch graduation, nearest the starting point and the scriber set at the first line to be marked off. Then the arm is moved up directly to the dimensions wanted.



Zagar Air-O collet holding fixture

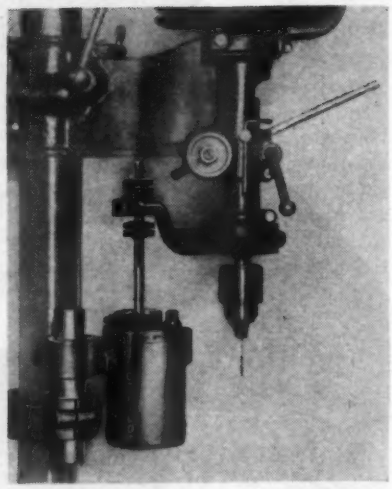
Zagar Air-O Collet Fixture Ties In With Machine Cycle

The Zagar Air-O collet holding fixture can be hooked up easily to the machine on which it is to be used by means of rod or chain, thus making its operation automatic. It is manufactured by Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio. It operates on an 90-lb. pressure air line, with air being used only to actuate locking and unlocking mechanism.

Lincoln Calculators Determine Welding Preheat Temperatures

Lincoln Electric Company, Cleveland, Ohio, has announced a calculator which enables determination of welding preheating and interpass temperatures of steels which must be so handled to minimize a tendency toward excessive hardening and possible cracking of the base metal adjacent to the weld.

Lincoln preheating calculator

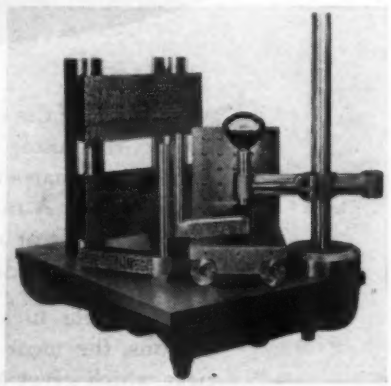


Copilot drill press feed regulator

Copilot Drill Press Feed Regulator for Many Makes

Special Devices Company, Berlin, Conn., is marketing a drill press feed regulator in a standard model for a limited number of popular makes and sizes of drill presses. It is a hydraulic, self-lubricating device.

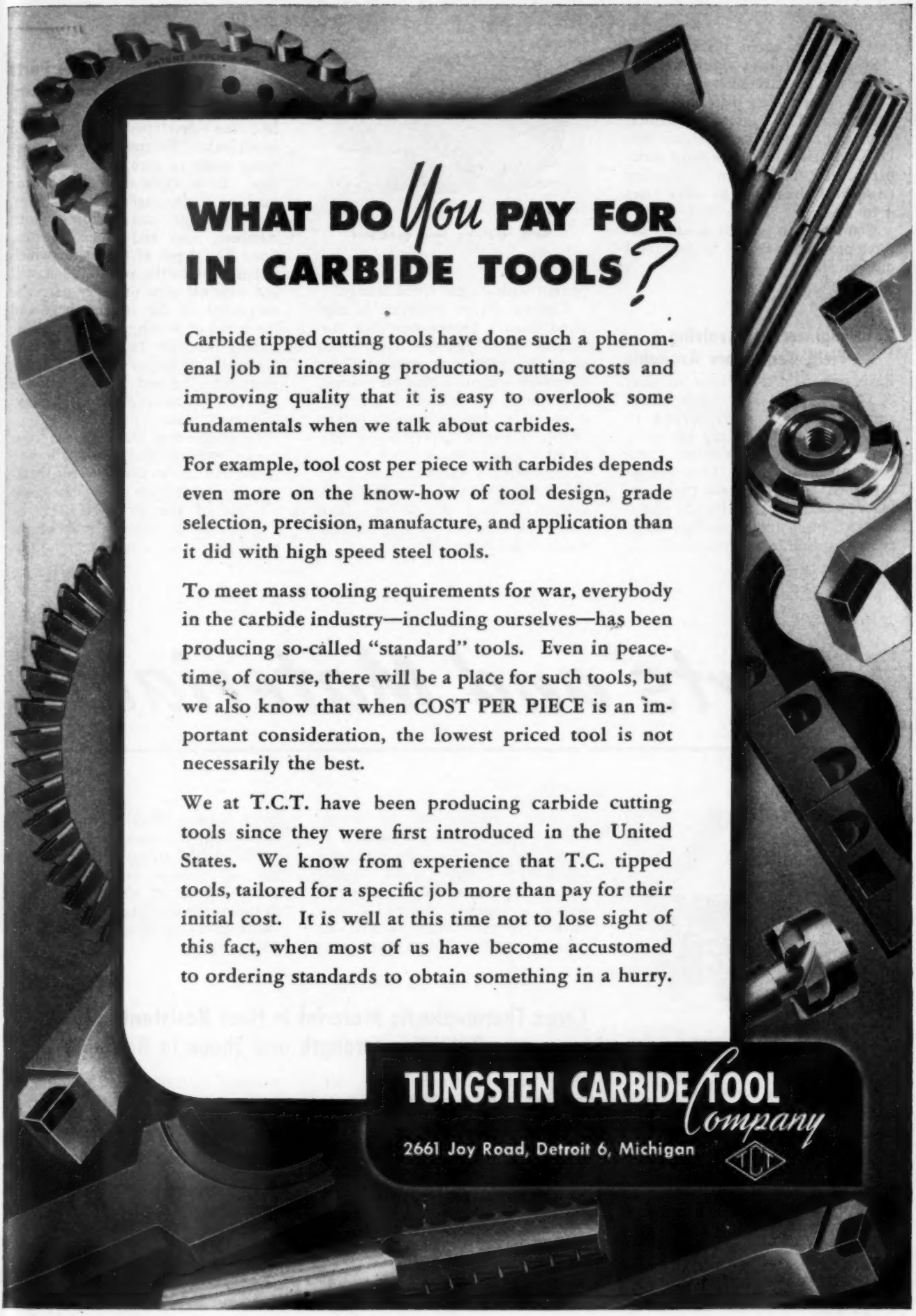
Among the features of the regulator is an arrangement to hold back backlash in the spindle feed mechanism. The device is said to prevent spindle dropping when the drill breaks through, and it permits free action for chip clearing and checks downward motion of drill before contact is again made with bottom of hole.



Thomas inspection combination

Thomas Inspection Combination Has Large Sine Angle Square

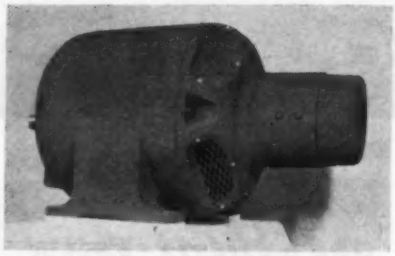
Thomas Tool & Machine Co., 66 N. Park St., Pontiac, Mich., is offering a three-part precision inspection combination which features a 7 × 12 × 12 in. sine angle square. This permits right- and left-hand horizontal angle measurement up to 75 deg. when used in conjunction with a


WHAT DO You PAY FOR IN CARBIDE TOOLS?
Carbide tipped cutting tools have done such a phenomenal job in increasing production, cutting costs and improving quality that it is easy to overlook some fundamentals when we talk about carbides.
For example, tool cost per piece with carbides depends even more on the know-how of tool design, grade selection, precision, manufacture, and application than it did with high speed steel tools.
To meet mass tooling requirements for war, everybody in the carbide industry—including ourselves—has been producing so-called "standard" tools. Even in peacetime, of course, there will be a place for such tools, but we also know that when COST PER PIECE is an important consideration, the lowest priced tool is not necessarily the best.
We at T.C.T. have been producing carbide cutting tools since they were first introduced in the United States. We know from experience that T.C. tipped tools, tailored for a specific job more than pay for their initial cost. It is well at this time not to lose sight of this fact, when most of us have become accustomed to ordering standards to obtain something in a hurry.
TUNGSTEN CARBIDE TOOL Company
2661 Joy Road, Detroit 6, Michigan
TCT

surface plate angle plate, vertical right- and left-hand angle measurements can be attained.

The heavy surface plate angle plate has hardened and ground cylindrical posts and cross plates. Posts are hollow and ventilated. The third member of the combination is a utility tri-square, obtainable in sizes from 4 to 16 in.

Combined to sell as a unit, the three products may also be purchased individually.



Kato revolving field generator

Kato Engineering Revolving Field Generators Available

Revolving field generators in sizes 5, 10, 15 and 25 kw., 4-pole (1800 r.p.m) and in sizes 5, 10 and 15 kw., 6-pole (1200 r.p.m) are being built by Kato Engineering Company, Mankato, Minn. These can be furnished as independent two bearing generators designed to fit standard SAE engine bell housings. Voltage regulation is approximately 10 percent with 2-cycle speed change.

Cooling air of generator is supplied from a blower type cast aluminum fan of the split type which clamps onto the shaft, making it easy to remove without taking off bearing.

Machines are furnished with amortisseur or damper winding which facilitates parallel operation of two or more generators.

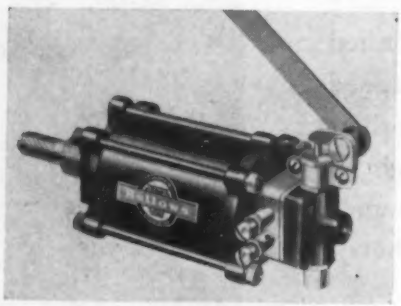
Generator is excited by a direct connected exciter at a standard excitation voltage of 125-v. Each model is available in all standard voltages and frequencies.

Ideal Toolroom Etcher Marks Iron, Steel Parts

The Ideal Commutator Dresser Company, 1057 Park Avenue, Sycamore, Ill., has developed the toolroom metal etcher, for use in etching anything made of iron, steel or its alloys. It is especially suitable for marking tools, gages, reamers, dies, punches, jigs and fixtures, with numbers, sizes and other information. The depth of the mark, which is burned into the surface so it will not wear off with ordinary usage, is controlled by the etching heat and the speed of writing. Four available etching heats are 120, 240, 420 and 700 watts. It has an indicating lamp, protected four-heat switch, terminal tap for 2-oz. etching tool and renewable work plate.

In addition to the standard four ounce etching tool, a small two ounce tool is also available for marking thin or delicate parts. The overall size of the etcher is $7\frac{1}{4} \times 5\frac{1}{8} \times 8\frac{1}{2}$ in. with a total weight of 16 lb.

Parts and Materials



Bellows BM air motor

BM Air Motor Is Complete Self-Contained Power Unit

Many hand operations can be done automatically by the application of a BM air motor, manufactured by The Bellows Company, Akron, Ohio. The device can be used to feed work to tools, tools to work, operate vises and holding fixtures and many other uses.

The valve operating lever is adjustable to any angle in any plane and is easily synchronized by simple linkage, cam or solenoid controls to a machine cycle for fully automatic operation. Infinite speed regulation of the piston rod in either direction is possible because of dual exhaust throttle controls. The air exhaust may be used to eject parts from holding fixtures or to clean chips from the work area.

Model BM air motor operates on any air pressure up to 175 psi. Power thrust is about five times operating air line pressure. Sizes are available in strokes ranging from $1\frac{1}{2}$ to 48 in.

Cerex Thermoplastic Material Is Heat Resistant, Retaining Strength and Shape in Boiling Water

High heat resistance is the outstanding characteristic of Cerex, a new thermoplastic developed by Monsanto Chemical Company, St. Louis 4, Mo. Cerex holds its shape and strength in boiling water, but can be molded by fast, economical methods. The material is now widely used in military electronic equipment, requirements that consume the total available output.

Cerex is described as a thermoplastic, readily moldable in standard molding machines, and combining high resistance to heat with resistance to strong, corrosive chemicals, excellent electrical insulating properties, and high rigidity and strength. Its heat distortion point is 220 F.

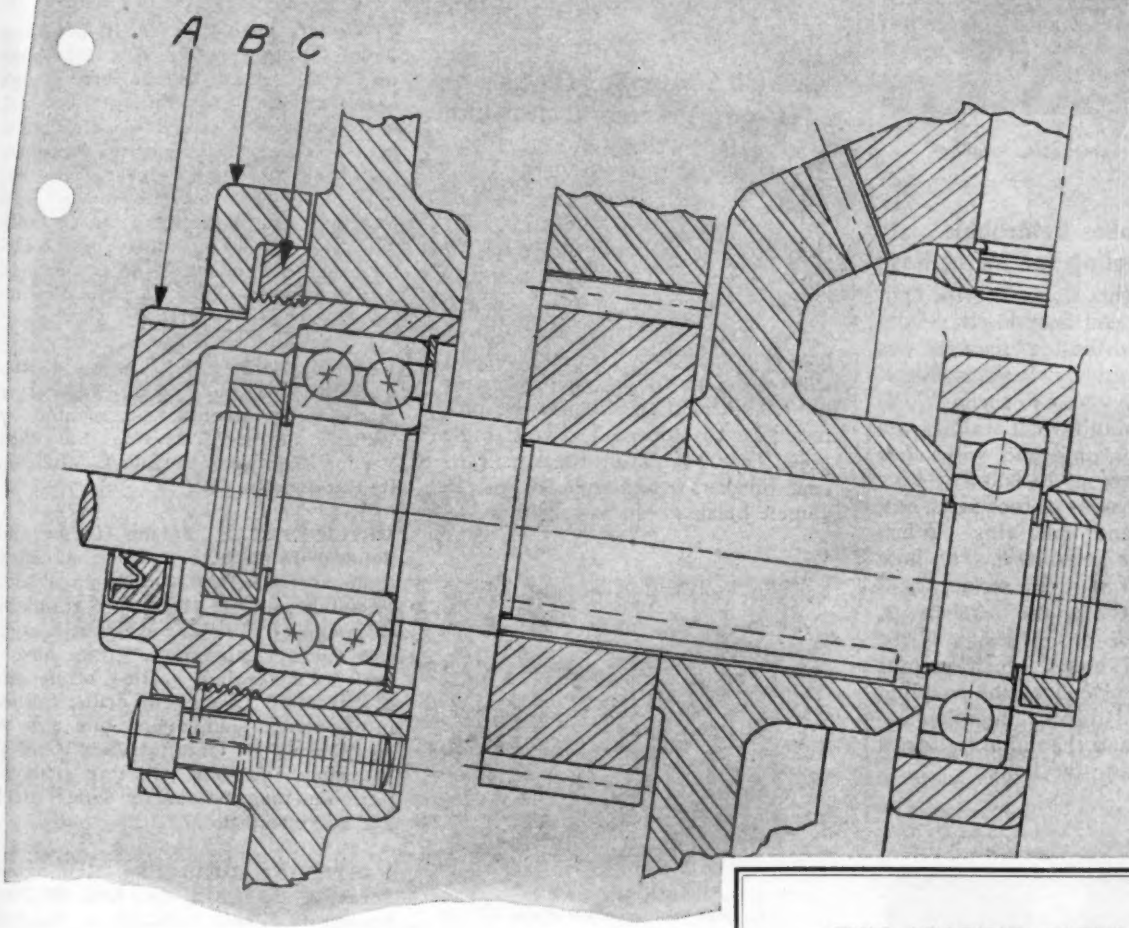
Specifications of Cerex include: specific gravity, 1.07; flexual strength, 13,000 psi.; hardness, Rockwell 100 M; power factor at 1,000 cycles, 0.0024; arc resistance 69 sec.; slow burning rate; water absorption, 24 hr., 0.30; clarity, amber transparent.

As One Gear To Its Mate —

". . . it's simply a matter of adjustment"

SUBJECT: Method for adjusting ball bearing mounted bevel gears.

COMMENTS: Requires no disassembly or fitting of shims.



Though now producing for war to the limit of our ability, we are mindful of the fact that, in either war or peace, assurance of satisfactory bearing operation is still obtained through the application experience of those who know ball bearings best.

Here is a detail that may be useful to you now or at a future time. However that may be, please feel free to call upon New Departure for application assistance at any time.

THIS BEARING MOUNTING

Gives stepless gear adjustment to any degree of exactness required.

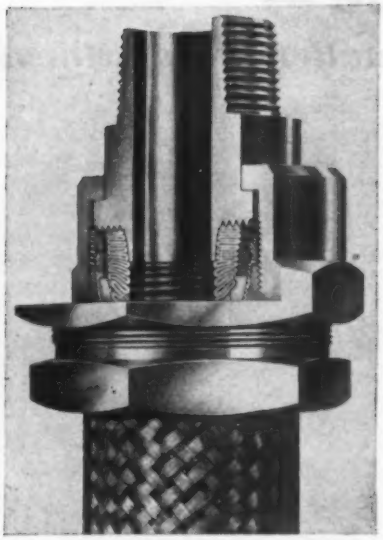
No removal of parts necessary. Simply loosen bolts slightly so sleeve "A" can be turned amount desired. Tighten bolts to clamp cover "B." Nut "C" is notched for bolts; does not rotate.

Applicable to either closed housing or where shaft extends through, as indicated.

NEW DEPARTURE
BALL BEARINGS 3270

NEW DEPARTURE • DIVISION OF GENERAL MOTORS CORPORATION • BRISTOL, CONNECTICUT

Sales Branches: DETROIT, G. M. Bldg., *Trinity 2-4700* • CHICAGO, 230 N. Michigan Ave., *State 5454* • LOS ANGELES, 5035 Gifford Ave., *Kimball 7161*



Packless detachable coupling

Packless Makes Detachable Coupling for Metal Hose

A detachable brass coupling for helical flexible metal hose in sizes from ¾ to 1½ in. inside diameter has been developed by Packless Metal Products Corp., New Rochelle, N. Y. It is mechanically self-sealing, requiring no brazing, and withstands pressure tests of up to 800 lb.

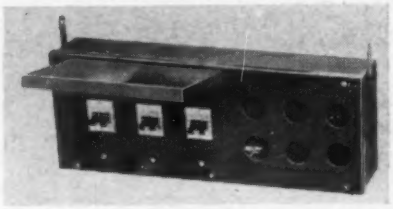
The unit consists of four parts, nut, back, stem and split ring. When assembled the convolutions of hose and the metal braid are securely held by pressure between the members. A further feature of its design is the self-contained union which permits the pipe thread end of the coupling to be screwed directly into the machine fitting and the union tightened without twisting the hose.

Acro snap-action switch

Acro Electric Makes a Tiny Enclosed Snap-Action Switch

Acro Electric Company, 1321 Superior Avenue, Cleveland 14, Ohio, has developed the Miniac, and extremely small fully enclosed snap-action switch. It is 17/64 in. thick, 13/16 in. high and 13/16 in. long and is designed on the rolling spring principle. The Bakelite enclosing case has four mounting holes.

Actuation is with a stainless steel pin plunger, but is designed to permit leaf type or over-travel plunger type actuators to be attached to the case. It is rated at 15 amp., 115 volt a.c.



Square D scatter box

Square D Scatter Box Controls Circuits Through Central Unit

The Square D Company, 6060 Rivard St., Detroit 11, Mich., has available a scatter box to control temporary power and light circuits through a central unit protected by circuit breakers. This device is particularly applicable in places where temporary circuits must be set up or torn down quickly. The box is built for from four to eight circuits with or without neutral. Circuits are protected by 15 ampere, 115 volt single pole, Type MO Multi-breakers (circuit breakers) although 20 or 25 ampere breakers can be substituted.

Cramer multi-contact timer

Cramer Multi-Contact Timers Control Sequence Operations

The R. W. Cramer Company, Centerbrook, Conn., is marketing a multi-contact timer for remote control applications. It is used to control sequence operations of a machine or for similar applications. Its solenoid starting mechanism is operated from a remote control momentary start button, so that the timer will go through its complete cycle of operation and then stop. Reclosing the momentary start button will either repeat the cycle or make it continue, if it has been interrupted.

TRADE PUBLICATIONS

ADHESIVES National Adhesives, 270 Madison Ave., New York 16, N. Y., has published a booklet entiled "The What, Where, Why, How of RESYN Adhesives." This 16-page booklet is written in non-technical language and traces the development of synthetic resin adhesives, defines the trade terms associated with them, describes their properties, suggests applications and outlines procedures for handling various types of resinous products.

CUTTING ALLOY Crobalt, Inc., Ann Arbor, Mich., has issued a data book on Crobalt A and 138, non-ferrous high speed cutting alloy and Powersteel, cast high speed steel tools. Crobalt is said to retain its temper at extremely high operating temperatures and otherwise resist heat, but presents no special problems of usage. Data includes tool and tip sizes, angles and clearances, recommended feeds and speeds, grinding procedures and brazing instructions.

DIAMOND DRESSER A line of diamond dressers and tools incorporating many improvements is presented by Willey's Carbide Tool Co., 1340 West Vernon Highway, Detroit 1, Mich., in its Catalog No. 41.

DRILL STEELS Jessop Hollow and Solid drill steels are described in a folder prepared by Jessop Steel Co., Washington, Pa. Data on standard sizes and sections of hexagons, rounds and quarter octagons is given, also a table to determine cutting off length of bar stock in making drills, taking into account shanks and bits size in relationship to total drilling length. Working and heat treating instructions and suggestions for longer drill life are included.

FASTENING DEVICES Remington Screw & Bolt Mfg. Co., Inc., 15 Desbrosses St., New York 13, N. Y., has announced its 1944 Catalog covering a complete line of bolts, nuts, rivets, screws, washers and other fastening devices. The catalog includes complete specifications, sizes and prices for all items, and miscellaneous data on decimal equivalents, discount multipliers and wire gauge decimal equivalents.

FLAME CUTTING A pocket-sized, slide-type guide that shows proper tip sizes, gas pressures and other factors required for machine gas-cutting steel of various thicknesses with Airco "45" and "124" tips, is offered by Air Reduction, 60 East 42 St., New York 17, N. Y. By setting the slide to a known factor such as steel thickness, the machine operator can find the correct tip size to use, oxygen and acetylene pres-

TEEMING THE MIGHTY STEEL INGOT

Steel takes its first solid form with the teeming or pouring of the ingot, an operation in which skill and experience contribute to the control of quality.

The ingot is the measure of steel production. Its teeming is the culmination of the mining of iron ore and coal, the quarrying of limestone, the production of iron in blast furnaces and the making of molten steel in open hearths and converters.

Vast quantities of raw materials are consumed and immense equipment and the labor and skill of hundreds of thousands of American workers are engaged in the processes leading up to production of the mighty steel ingot — ninety million tons of which were produced in this country last year.

Steel from these millions of tons of ingots now moves forward to invasion, arming our fighting men, affording them maximum protection as they achieve victory. And with the peace to come, new steels will serve us in new and better ways.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH, PENNSYLVANIA

J&L STEEL

CONTROLLED QUALITY STEEL FOR WAR

J&L STEEL RECORDS

Three world records for the production of steel and more than two thousand of its own production records (total of 2,018) were broken by Jones & Laughlin Steel Corporation works in 1942, 1943 and 4 months of 1944. "These 2,018 records since Pearl Harbor," President H. E. Lewis said, "made possible by the many thousands of men and women of J&L working in close cooperation with management, in mines, quarries, transportation lines, furnaces, mills and plants, are indeed an achievement in which all may take gratification for a job well done, and be inspired to do even better in the critical days of invasion." The records Mr. Lewis pointed out, included daily, weekly, monthly and yearly records, with 882 new highs at Pittsburgh Works, 791 at Aliquippa Works, 300 at Otis Works, Cleveland, and 45 at McKeesport, Pa., (a special ordnance plant). During this record-making period, J&L operated, and is still operating, above 100% of rated capacity.

U. S. Maritime Commission has awarded the Pittsburgh Works of Jones & Laughlin Steel Corporation its Gold Star to be added to the "M" Pennant presented last September, in recognition of continued production achievement. In congratulating the company, Admiral H. L. Vickery, Maritime Commissioner, said: "As our fighting forces press forward the advance on Berlin and Tokyo, it is my sincere hope that your company will continue to maintain or better its production record until victory is achieved." The Pittsburgh Works and the Aliquippa Works of J&L have both won the Army-Navy "E" flag with star for excellence in War production.

Fiery rivers of steel for war continuously pour out of open hearth and electric furnaces and Bessemer converters in the steel works of America into heavy cast iron ingot molds, tall as a man. The molds may be square, round, rectangular or truncated, according to ultimate shape the steel is to take in rolling and finishing mills. Each mold may have capacity for 5, 10, 12 or even 15 tons of molten steel. As easily as you would handle a bucket of water, metal crane operators adroitly swing great, thimble-shaped ladles full of tons of molten steel over the row of waiting ingot molds on low cars ("buggies") into which the steel will be teemed.

On the "teeming" platform (see illustration) the skilled steel pourer, nozzle setter, capper and metallurgical inspector move into action. First the nozzle in bottom of great ladle is cleared out, a sharp rod is pushed in, stopper handle is raised and steel bursts out in a bright stream that runs gurgling into the mold. When mold is filled, the steel pourer shuts off the fiery stream and signals craneman (upper left in illustration) to move to next mold, which he does with skill to prevent splashing. This goes on until the ladle is empty. From 10 to 40 ingots are thus teemed, depending upon sizes of molds and ladle.

Again
WENDT
SONIS
STANDARDIZES
another group of carbide tipped tools
SHELL END MILLS
Tool No. SEM for cast iron and non-ferrous materials. Tool No. SSM for cutting steel. Sizes: 1¼" to 6". 4 to 10 teeth. Use up to 20" table feed per minute.
MILLING CUTTERS
Five tool styles for milling steel and non-ferrous materials. Diameters: 3" to 8". 4 to 10 teeth.
ARMY
NAVY

They're here! They're New! They're Standard! These Wendt-Sonis cutting tools are especially designed carbide tipped cutting tools—not adaptations of high speed steel designs.

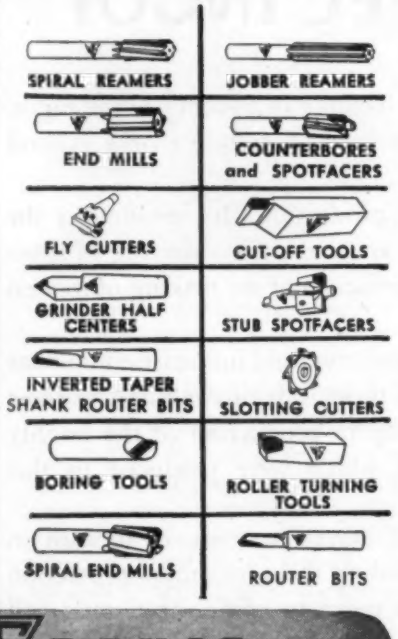
DISTINCTIVE CHARACTERISTICS—

1. **New flute angles**
2. **New fillet designs**
3. **New shank designs**

—*plus* 25% longer carbide tips on all round tools. All these new tools—many of which were formerly classed as "special" are now standard and listed in new W-S Catalog No. 144. Order through your nearest Wendt-Sonis distributor . . . or write to WENDT-SONIS COMPANY, Hannibal, Missouri or BRANCH WAREHOUSE, Long Beach, Calif.

NEW!

W-S Catalog No. 144 just off the press. Contains all new standardized tools and latest prices. WRITE TODAY for your FREE copy.



WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • ROUTER BITS • SPECIAL TOOLS

sures required, estimated gas consumption, width of kerf and average cutting speed to be expected. The reverse side of the guide lists many helpful hints for the operator.

HOB CHECKER Its new resharpening checker for hobs, milling cutters and form cutters is described in bulletin No. 471-44 issued by Michigan Tool Co., 7171 East McNichols Road, Detroit 12, Mich. The bulletin includes machine details and specifications and installation photographs.

HOIST Operating and construction details of the 500-lb. "Handi-Lift" electric chain hoist, recently added to the P & H line, are illustrated and described in Bulletin H-23 available on request from Hoist Div., Harnischfeger Corp., Milwaukee 14, Wis. Condensed specifications, clearance data and typical installation photos are included.

HOLE PUNCHING Wales Type "BC" hole punching units, for punching an unlimited number of straight line, scattered and staggered hole patterns with varying center-to-center distances, and numerous other punching applications, are presented in Catalog "BC" offered by the Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, N. Y.

LEATHER BELTING J. E. Rhoads & Sons, 34 North Sixth St., Philadelphia 6, Pa., has prepared a folder on its flat leather belting and miscellaneous products. Besides giving complete information about this belting, the folder includes a lacing table, lacing instructions, a selection guide and a chart of horsepower ratings.

MANAGEMENT A report giving the results of actual surveys on what management, labor, science and government think of "functional' music in war plants, factories, offices and other places of work, has been published in the form of a booklet entitled "Muzak at Work" by the Muzak Corp., 229 Fourth Ave., New York, N. Y. In addition, the booklet contains a description of Muzak facilities and service for "planned work music."

METAL TUBING American Metal Hose Co., Waterbury, Conn., has announced publication of Bulletin No. SS50. This 40-page, illustrated catalog gives the complete story on American seamless flexible metal tubing, its features, advantages, uses, installations and other pertinent information.

MOTOR DRIVES "Motorize with Masterdrives" is the title of a booklet issued by The Master Electric Co., Industrial Equipment Div., Dayton 1, Ohio. It gives a history of Masterdrives, lists their advantages, and specifies machines on which applicable.

OIL RECLAIMER Bulletin YM-700, covering its new Robot oil reclaimer, may be secured from The Youngstown

Miller Co., Sandusky, Ohio. The bulletin explains how the unit operates, the materials required for its operation, and the advantages to be gained through its installation.

PLATING A new booklet on anodes and plating chemicals has been issued by the Hanson-Van Winkle-Munning Co., Matawan, N. J. This booklet, Bulletin AC-105, also discusses various plating processes and a separate section is devoted to solution control.

PUMPS Worthington Pump and Machinery Corp., Harrison, N. J., has released Bulletin W-414-B40 on Type VTE power pumps for high pressure hydraulic service, and Bulletin W-324-B2 on regenerative turbine pumps. The features, operation and applications on each type are given plus complete data on sizes, specifications, ratings and other engineering information.

SHAPERS General Engineering & Mfg. Co., 1523 South Tenth St., St. Louis, Mo., has published an illustrated bulletin on the application of its plain, production and universal multi-purpose shapers. Complete data on specifications and dimensions of eleven machines is included as well as a description of the Lubrigard, an automatic safety feature.

SPEED CONTROL A four-page illustrated Bulletin No. WTM-44, issued by Weltronic Co., Detroit 19, Mich., describes the new Weltronic electronic adjustable speed motor drives which operate any d-c shunt-wound ½ hp. to 15 hp. motors from a-c power supply for such machines as lathes, grinders, drill presses and other machinery. Also included are a detailed description and a schematic diagram showing the operation of this motor control, and complete specifications of the line of motor controls.

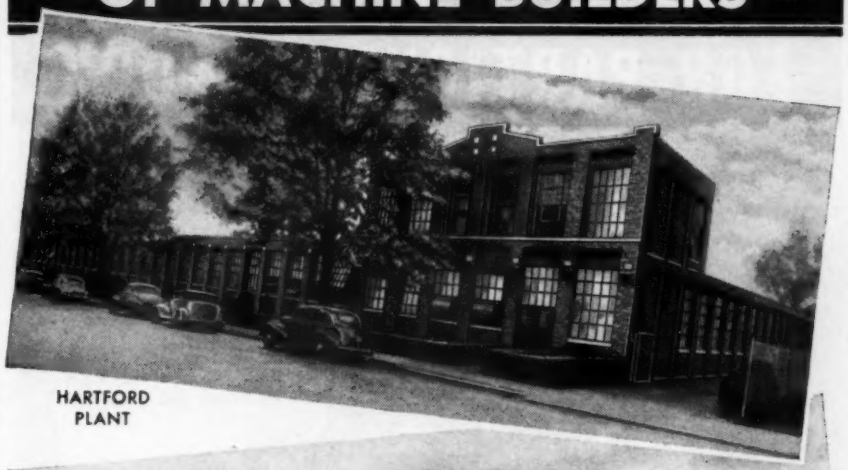
TOOLS Precision production tools are illustrated and described in a catalog, No. 44, recently published by the Acme Tool Co., 200 Church St., New York 13, N. Y. Requests must be made on company letterhead.

TRUCKS Crescent Truck Co., Lebanon, Pa., has issued a catalog which illustrates and gives specifications for all Crescent trucks now being manufactured under WPB limitation orders 112 and 112A.

UNIVERSAL JOINTS Bulletin No. 103 on universal joints for aircraft is now available from The Apex Machine & Tool Co., Dayton 2, Ohio. Data on sizes, strength and weight ratio is set up in handy table form. Specifications are given both for heavy-duty and light-duty joints and torque and deflection data are chartered.

VISES Reimuller Brothers Co., 9400 Belmont Ave., Franklin Park, Ill., has

THREE GENERATIONS OF MACHINE BUILDERS



HARTFORD PLANT

NEW BRITAIN PLANT

Look to FENN for Your Special Machinery Needs

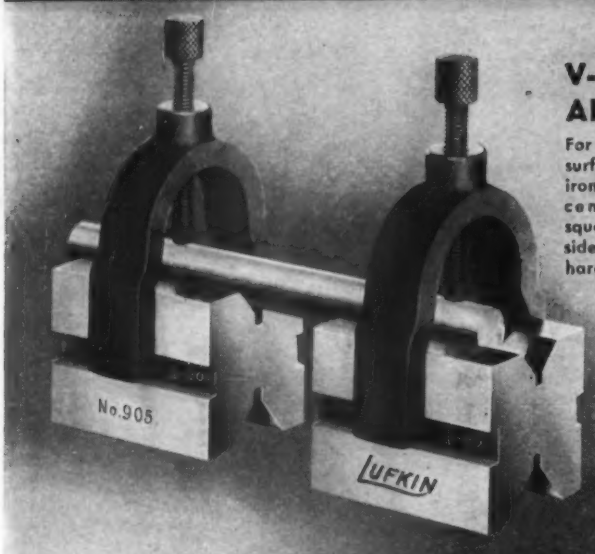
Fenn Plants, wholly engaged in war production today, will, when peace comes, continue building special machinery, in which they have majored for three generations. If you are thinking of building new machines or remodeling old ones, it's time to plan Now. Fenn designers and engineers have solved many knotty problems in machine design, resulting in efficient, profitable production. Fenn has the men and experience to handle almost any machine design job. Consultation is invited and involves no obligation.

Fenn Aircraft
BUILT PARTS FOR FAMOUS PLANES

Fenn Plants are delivering precision parts and sub-assemblies for planes, artillery and other vital war equipment to practically every industrial center.

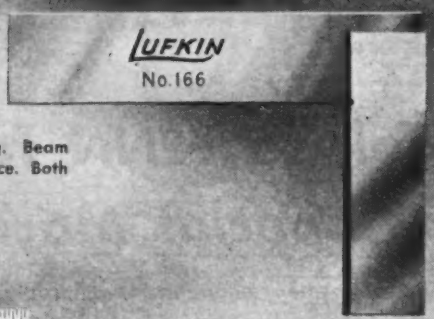
THE FENN MANUFACTURING CO.
HARTFORD, CONNECTICUT

LUFKIN TOOLS
FOR PARTICULAR WORK



V-BLOCKS AND CLAMPS

For laying out work with surface plate or angle iron. The V's are ground central, parallel and square with the ends and sides. Made of tool steel, hardened and ground.



HARDENED, SOLID STEEL SQUARE

A master square for accurate checking. Beam is solid, being constructed in one piece. Both beam and blade are lapped.

DIEMAKERS SQUARE

Blades slide in the head and can also be adjusted at an angle with the stock. Heads hardened and ground. Available with Standard, Bevel, Narrow and Offset Blades.

For complete facts about these or any other Lufkin Precision Tools, SEE YOUR DISTRIBUTOR. Write for free catalog.

LUFKIN
SAGINAW, MICHIGAN · NEW YORK CITY
TAPES · RULES · PRECISION TOOLS

prepared a bulletin on its hydraulic vises for holding, marking, bending, riveting and other similar operations. Full information on features and specifications is included.

WELDING FITTINGS Tube Turns, Inc., Louisville, Ky., has published a handy pocket-size dimensional data chart which gives complete quick-layout information for every Tube-Turn welding fitting and flange. This 9 × 24-in chart can be spread out on drawing board or desk, or can be folded to 9 × 4 in. Requests must be made on company letterhead.

WELDING POSITIONERS Complete description and specification on P & H's recently announced Model WP-2 welding positioner are given in a bulletin released by the Welder Div., Harnischfeger Corp., Milwaukee 14, Wis. Included is a comparison chart showing how welding time efficiency is increased when work is positioned to the best advantage.

NEW BOOKS

MECHANICAL WORLD YEAR BOOK, 1944—*Published by Emmott & Company, Ltd., 78 Palatine Road, Manchester 20, England. 266 pages. Price 2 shillings, 6 pence.*

The 1944 edition of this year book contains, in addition to the usual engineering and conversion tables and other mechanical data, a review of developments in various phases of metalworking and materials as viewed in Britian.

In many respects, this volume is like American mechanical handbooks except that it is not so comprehensive. Another difference is in the fact that it contains advertising on British manufacturers. Too, it does not confine itself strictly to mechanical subjects, including as it does, such things as a table of decimal equivalents of the British pound and a buyers' directory in three languages.

MARINE COPPERSMITHING—*By Frank J. Carr, Puget Sound Navy Yard. 195 pages. Published by McGraw-Hill Book Company, 330 West 42 Street, New York 18, N. Y. $2.*

Coppersmithing has been neglected in the education of engineers and designers, probably because of the complexities of the trade. Here, however, is a comprehensive attempt to set down the fundamentals of this important craft in a form that is easy to assimilate. While the subject is approached from a shipbuilding point of view, much of the subject matter is basic.

Starting with the simple tools employed, this book runs the gamut through heat, acids, tinning, various types of joints and other tricks of the trade and concludes with a section or the terminology of shipbuilding.

Coppersmithing has been termed a trade which cannot be learned from a book. Thus, Mr. Carr has written his book as a supplement to the visual instruction which is so necessary.

•

GUIDE FOR SETTLING CANCELLED WAR CONTRACTS—*By J. J. Carroll. Published by Cope, Inc., 380 Chester Ave., Cleveland 14, Ohio.* $2.50.

The author presents a complete plan, with all necessary forms and instructions for using, based on his experience in supervising the settlement of claims resulting from cancelled contracts.

The guide has been created for the many thousands of contractors who will be faced with cancellations and who must be prepared with a workable plan to effect prompt settlements or face drastic financial consequences in the event of prolonged delays.

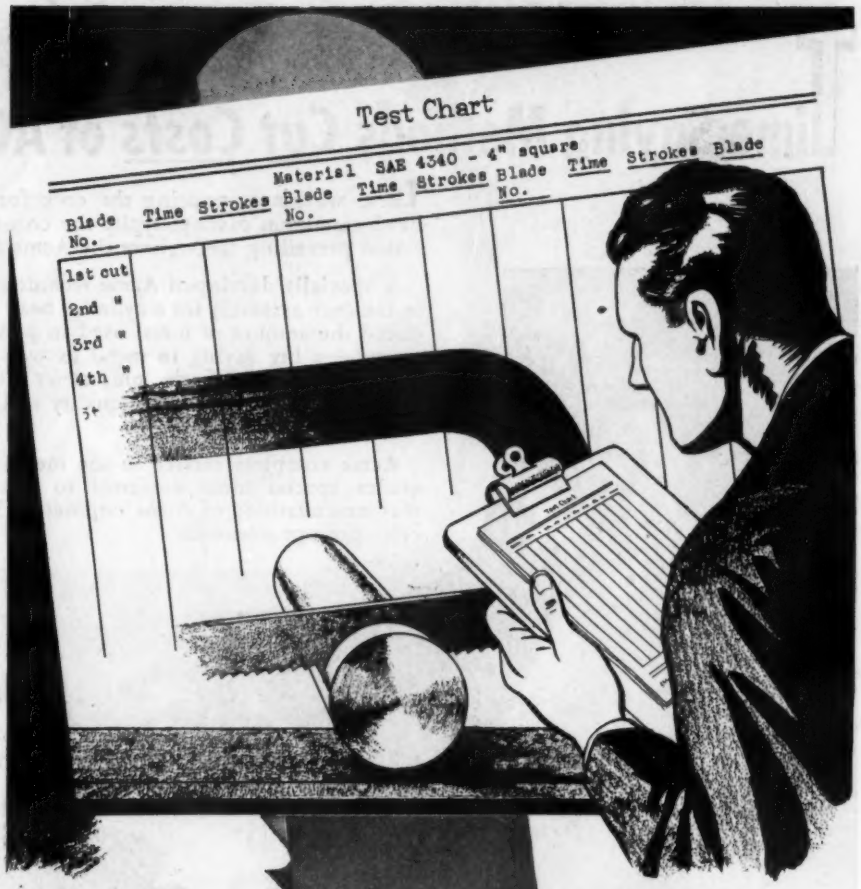
Speed of Arc Welding Saves Production Time

RECENTLY it became necessary to repair or replace as speedily as possible a tank that supplied water to a large forging press. Installed some yars before, the tank had become hemmed in all around due to plant expansion, so that it was impossible to replace it with a prefabricated tank. Thus, it was decided to construct a new welded tank about 6 ft. × 20 ft. × 4 ft. deep to be located on a high platform.

The size of the pieces which could be hoisted into position was first determined, then details of the necessary holes in the plates and the angles were arranged. With the new material prepared and at hand, the old tank was dismantled by acetylene torch and the new parts quickly assembled and tack-welded. The welding was done in 20 hours from eight o'clock Sunday morning to 4 a.m. Monday.

Estimated cost of welding the job was three times less than riveting, which would have taken twice as long. The time saving here was vital since the work of about twenty men depended on the output of the forging press supplied by the water tank. Any time lost there would have started repercussions in the shipyards to which the products of the press go.

From a paper submitted by Arthur T. Tigue, Engineering Draftsman, The Midvale Steel Co., Philadelphia, Pa., in the Industrial Progress Award program sponsored by The James F. Lincoln Arc Welding Foundation, Cleveland, Ohio.



HACK SAW BLADES LAST LONGER

After Capewell Field Engineer Analyzes Tool and Die Job

More cuts per blade were secured by an eastern tool and die shop. Previously this concern had presented its information to a Capewell Field Engineer. He, in turn, studied the size and characteristics of the steel bar being cut, and recommended the Capewell hack saw blade best suited to cut costs on this particular job. An extended test then showed longer life and lower blade cost.

Perhaps your own sawing costs are not as low as they should be. Better talk to your Capewell hack saw distributor.

CAPEWELL
HACK SAW BLADES

The Capewell Mfg. Co.
Hartford 2, Conn.

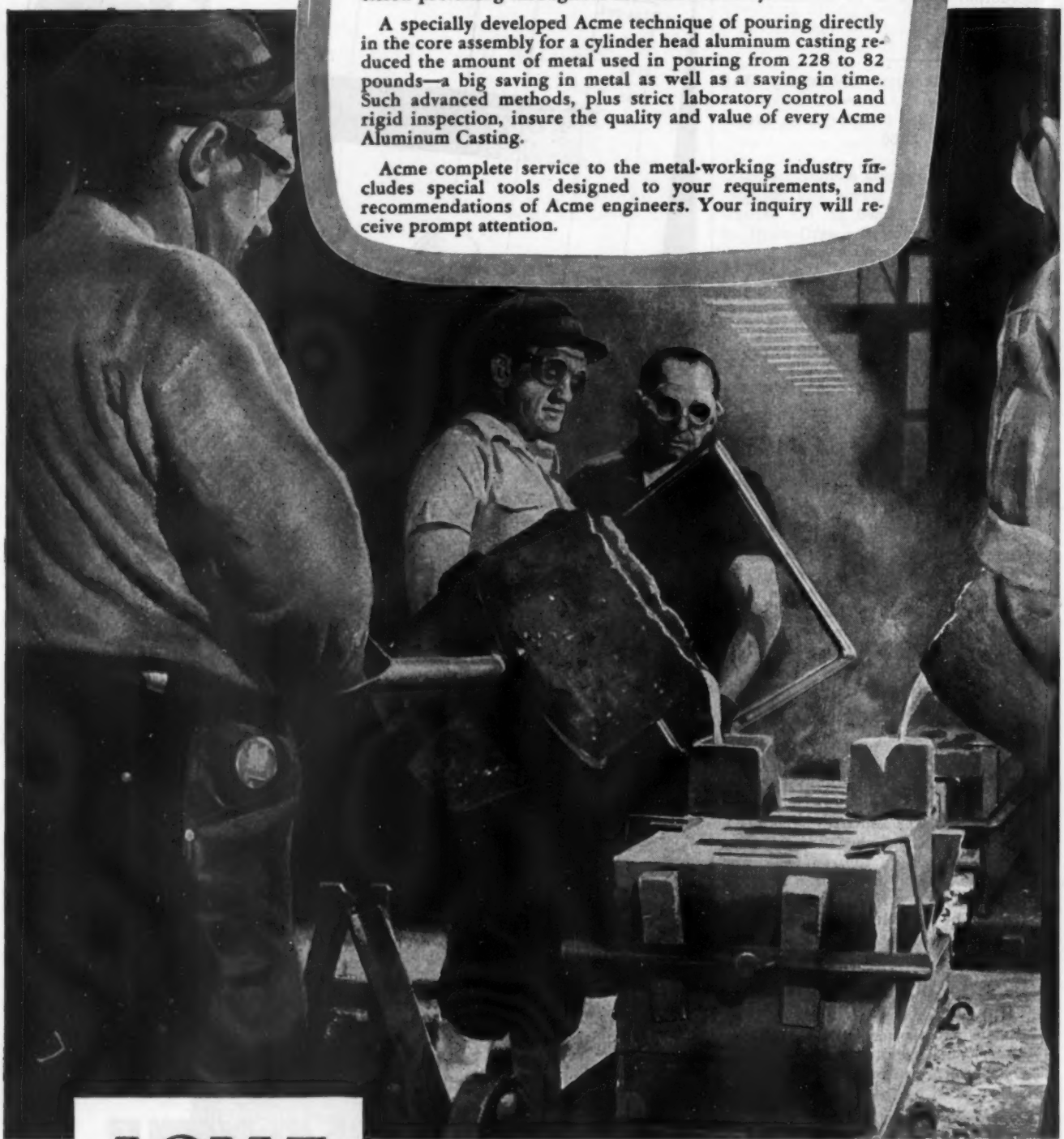
The trend is to TECHNITE, the molybdenum high speed hack saw blade

Time Saving Methods *Cut Costs* of ACME CASTINGS...

These workmen, pouring the core for an aircraft cylinder head aluminum casting, typify the cost-saving skill and precision prevailing throughout the Acme foundry.

A specially developed Acme technique of pouring directly in the core assembly for a cylinder head aluminum casting reduced the amount of metal used in pouring from 228 to 82 pounds—a big saving in metal as well as a saving in time. Such advanced methods, plus strict laboratory control and rigid inspection, insure the quality and value of every Acme Aluminum Casting.

Acme complete service to the metal-working industry includes special tools designed to your requirements, and recommendations of Acme engineers. Your inquiry will receive prompt attention.



ACME *Pattern and Tool Company, Inc.*
DAYTON, OHIO

FOR VICTORY BUY WAR BONDS AND STAMPS

HEAT-TREATED ALUMINUM CASTINGS...PATTERNS.. TOOLS...TOOL DESIGNING...PRODUCTION PROCESSING

Official U. S. Navy Photo

It has to be a precise, accurate operation . . . machining barrel riflings of the Navy's 16-inchers.

Whether machining big guns or countless other war materiel, operators everywhere are "in the groove" when they use Texaco Cutting Oils for faster machining, longer tool life.

Texaco Cutting Oils permit higher speeds and feeds, with improved surface finish. They lubricate the tools, and by carrying away the heat prevent chip welding; and lengthen tool life, assuring greater output.

Texaco lubricants have proved so effective in service that they are definitely preferred in many fields, a few of which are listed at the right.

The services of a Texaco Engineer specializing in cutting coolants are available to you through more than 2300 Texaco distributing points in the 48 States. The Texas Company, 135 East 42nd Street, New York 17, N. Y.

THEY PREFER TEXACO

★ *More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.*

★ *More revenue airline miles in the U. S. are flown with Texaco than with any other brand.*

★ *More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.*

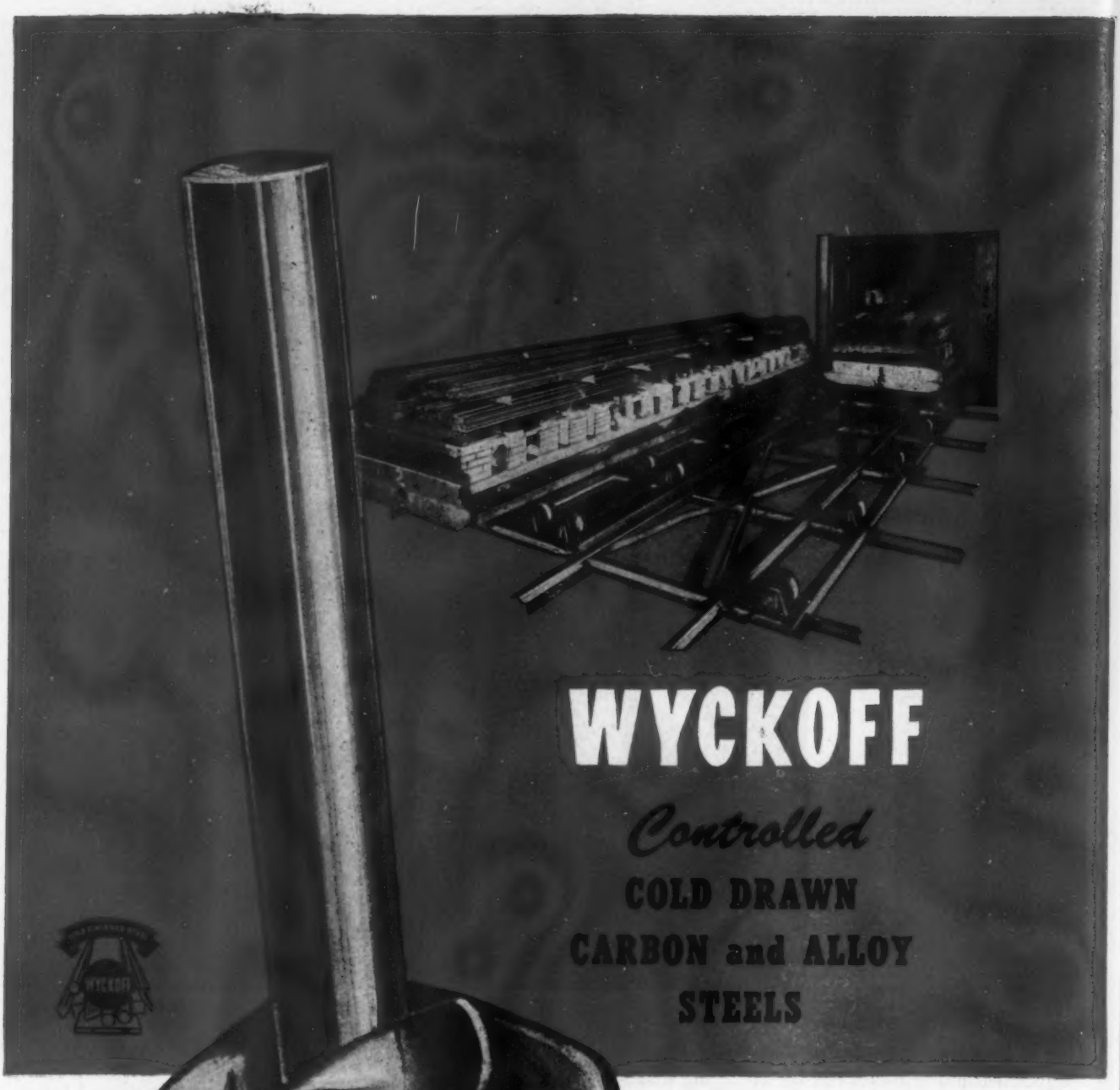
★ *More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.*

★ *More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.*

TEXACO

TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS FOR FASTER MACHINING

TUNE IN THE TEXACO STAR THEATRE EVERY SUNDAY NIGHT – CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY



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Controlled

COLD DRAWN CARBON and ALLOY STEELS

QUALITY-IDENTIFIED *Performance* IN EVERY OPERATION

Turned and Polished, Turned and Ground Shafting. Annealed, Strain and Stress Relieved, Heat Treated, Quenched and Tempered Steels. Wide Flats Up to 12" x 2".

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FIRST NATIONAL BANK BUILDING . . . PITTSBURGH, PA.
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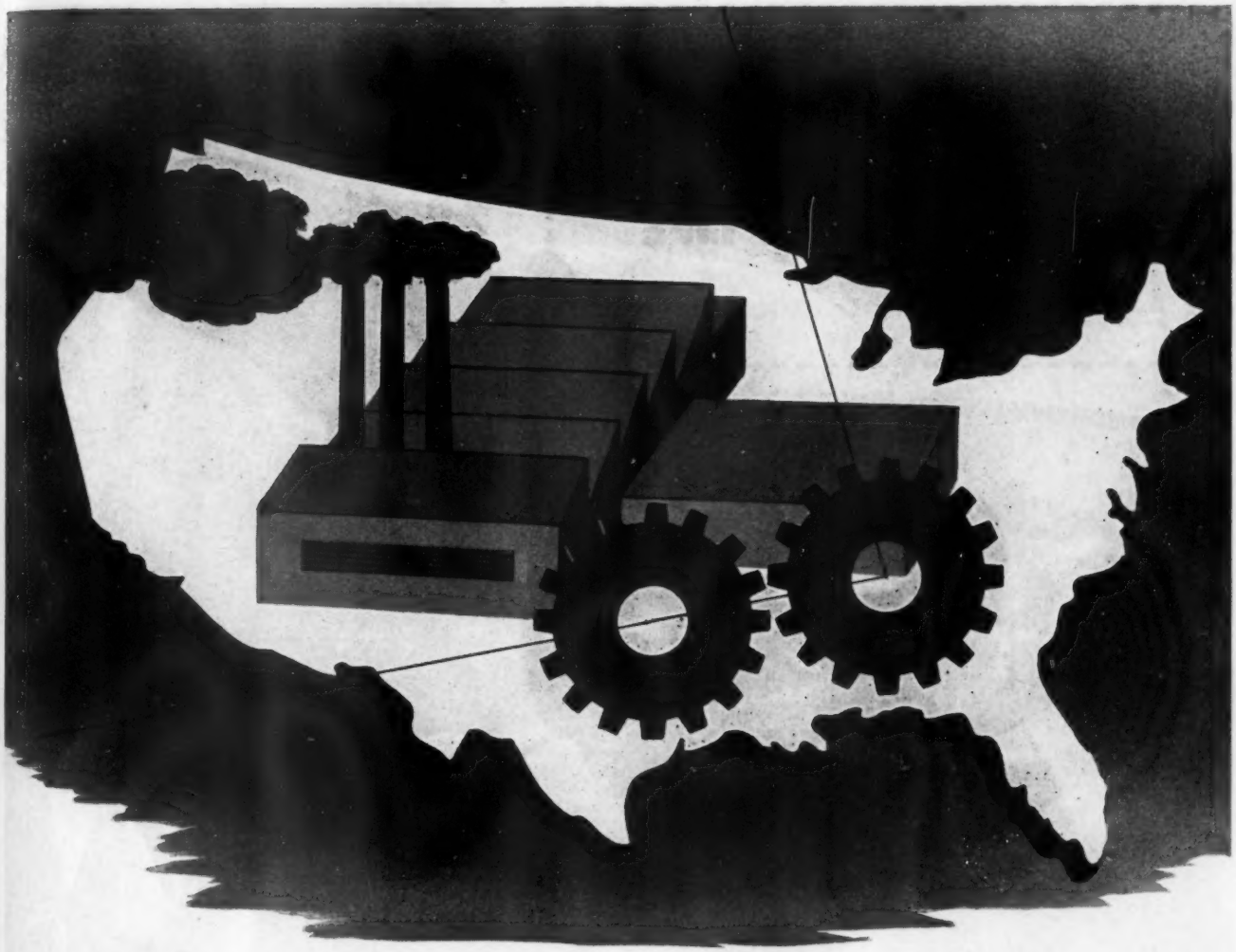
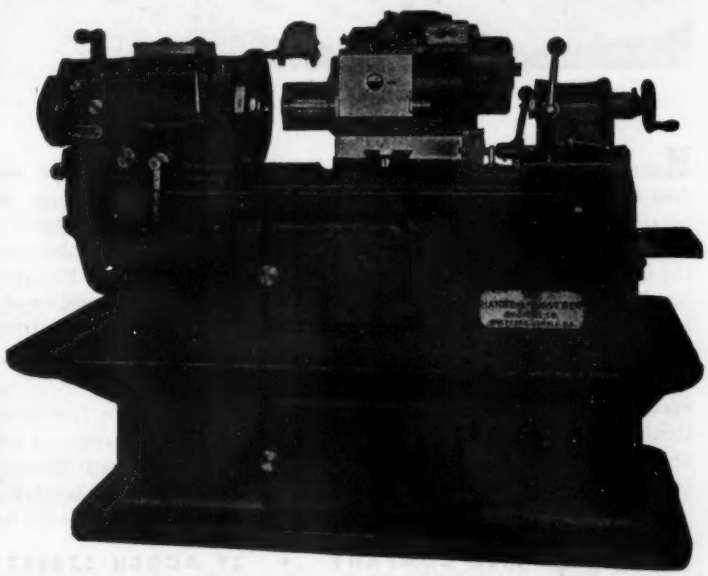
Mills at Ambridge, Pa. and Chicago, Ill.



Production Plus

Production is today **LITERALLY** a matter of life or death. H-W Semi-Automatic Thread Milling Machines are winning production victories . . . by saving precious time in thread production . . . by minimizing spoilage . . . by securing highest precision on difficult work. The H-W Milling Process employs multiple cutters that finish threads in one revolution . . . producing internal, external or taper threads . . . right or left hand . . . with equal speed, facility and precision. If you have a threading problem, write or wire. . . .



ARMY E NAVY

THE HANSON WHITNEY MACHINE CO.

HARTFORD CONNECTICUT U.S.A

GIVING A MACHINE THE BREATH OF LIFE

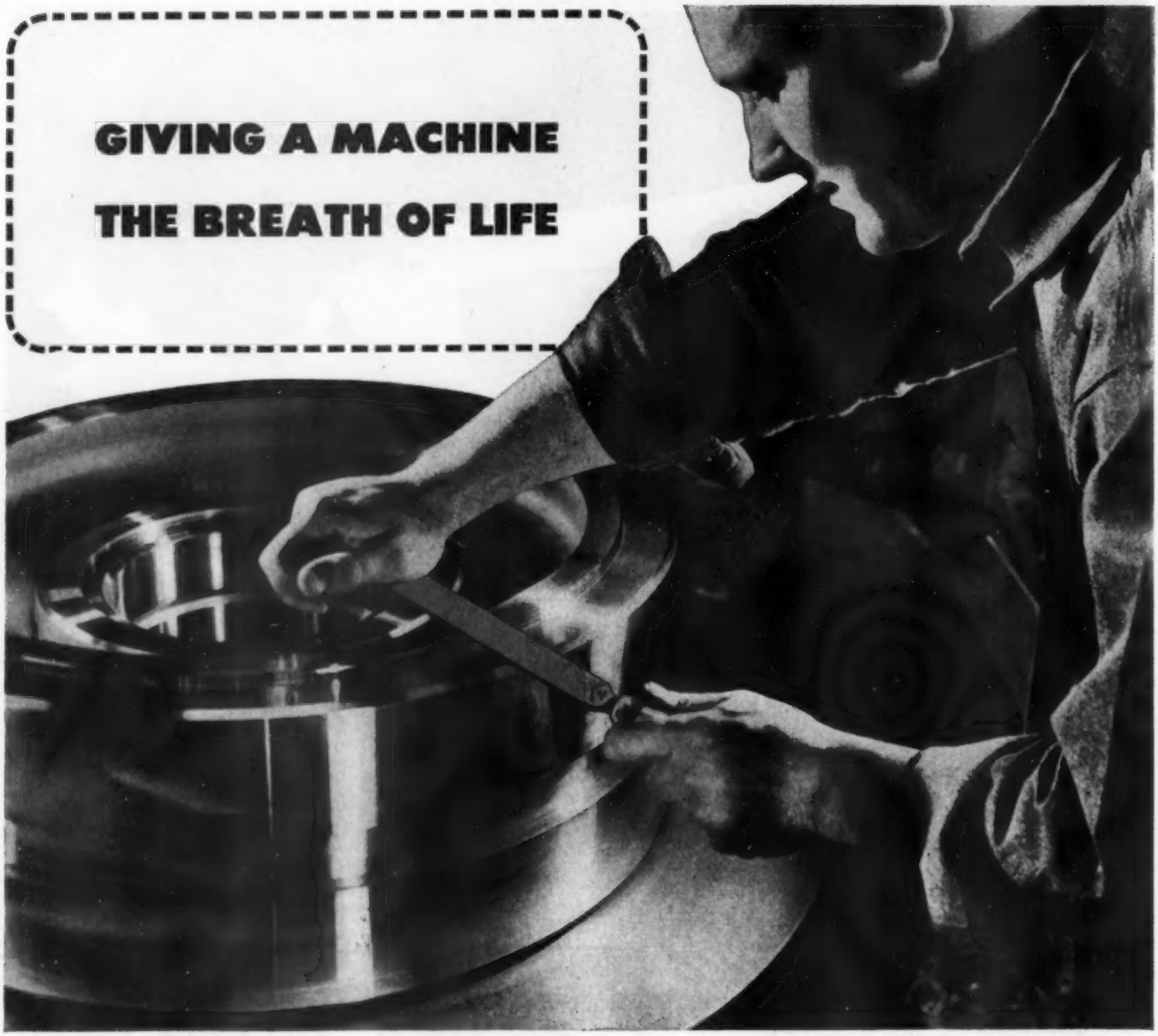


Photo courtesy Fawick Airflex Co.

HERE you see the spider of a reverse gear unit getting a fine finish while being rotated on a vertical milling machine. It is one of the many cases where only the combination of trained mind, skilled hands and the *right file* can provide the final touch that means good performance.

No single type of tool has yet been discovered which can be applied with greater versatility toward "making things work" than files. Their production constitutes an "industrial art" which can well be a tool manufacturer's sole business.

For smooth-filing, there are special Nicholson Files for aluminum, brass, plastics, die castings, soft-metal forming dies, lathe-rotated parts, and for other special applications or materials; and X.F. Swiss Pattern files in almost innumerable shapes and sizes for finishing and assembling small machine and instrument parts of steel, silver and other metals.

For 80 years, Nicholson has been making files and nothing else. Much of today's improved file-cutting machinery is Nicholson-designed. Nicholson devotes its field studies wholly to the application of files—in industrial production, in sharpening tools and implements, in working different kinds of metals, alloys and other materials.

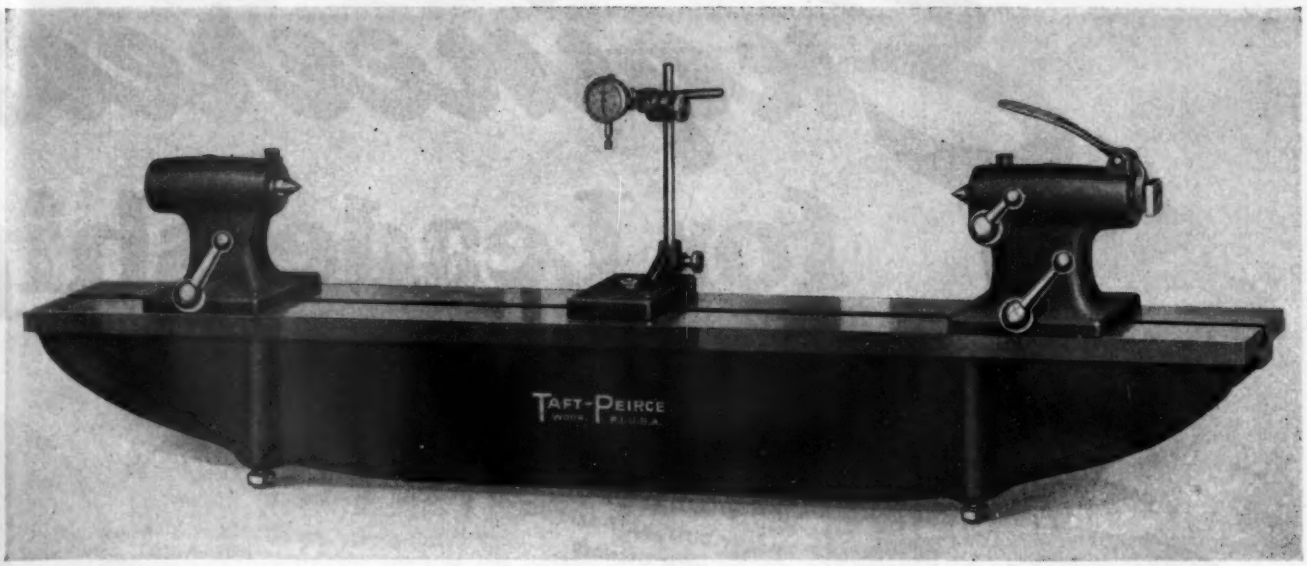
When seeking files for specific purposes, you can be sure that in Nicholson or Black Diamond brands you can obtain exactly *The right file for the job* —under the quality guarantee of *Twelve perfect files in every dozen.*

FREE BOOK, *"File Filosophy,"* is an interesting, illustrated "handbook" on file manufacture, kinds, use and care—helpful to production and purchasing heads, foremen, key mechanics.

NICHOLSON FILE COMPANY • 29 ACORN STREET • PROVIDENCE 1, RHODE ISLAND, U. S. A.

(Also Canadian Plant, Port Hope, Ont.)

NICHOLSON FILES FOR EVERY PURPOSE NICHOLSON USA

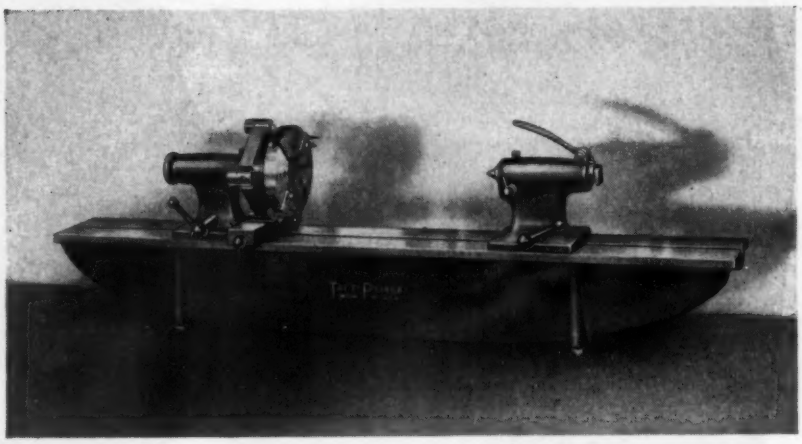


Taft-Peirce Style 9205 Bench Center with dial indicator. Indicator bracket base, 3¼" x 4½". Height of post, 8½".

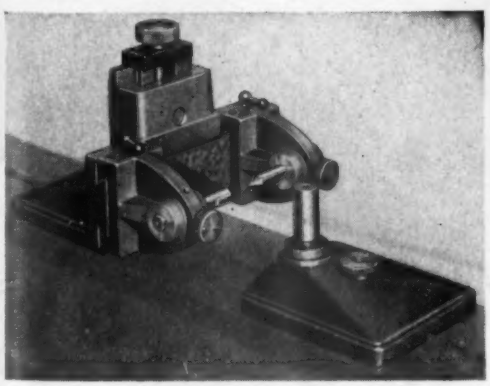
TAFT-PEIRCE
Bench Centers
Heighten the Speed and Accuracy of Inspection Work

Centering or removal of the work is facilitated by a spring-actuated sliding sleeve in the tailstock center. This spring center may be locked in position, when indicating heavy work, by a convenient clamping lever.

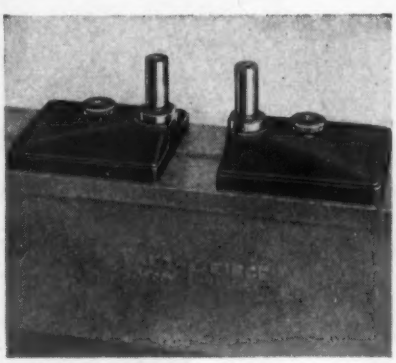
Head and tailstocks are aligned by keys which fit a ½-inch T-slot in the bed. This makes it readily possible to lock the head and tailstocks at any point on the bed and to mount a standard dividing head. Other uses and fixtures for Taft-Peirce Bench Centers are shown at the right and below. These precision inspection tools are made in 18" or 36" lengths between centers, with a tandard swing of 8". Quotations for the asking.



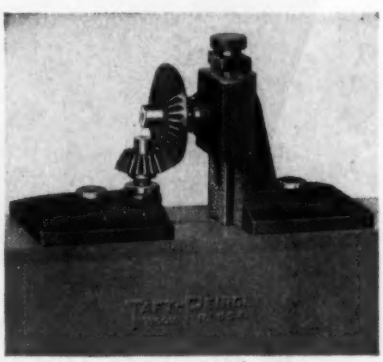
Taft-Peirce Style 9205 SB Bench Center with Sine Bar Indexing Head with Face Plate, for accurate indexing and dividing.



Worm Gear Head and Plain Head on Taft-Peirce Style 9205 GR Bench Center.



Spur Gear Plain Heads on Taft-Peirce Style 9205 GR Bench Center.



Bevel Gear Checking Head and Plain Head on Taft-Peirce Style 9205 GR Bench Center.

THE TAFT-PEIRCE MANUFACTURING COMPANY

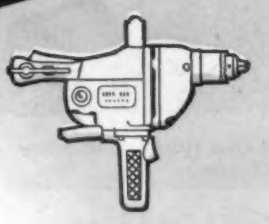
WOONSOCKET T-P **RHODE ISLAND**

Engineered for Leadership

Check These Features of Black & Decker Heavy-Duty Grinders

- Powerful Black & Decker Motors
- Grease-Sealed Ball Bearings near ends of Spindle minimize vibration
- Extended Wheel Spindles*
- Tapered End Housings* • High Center Line*
- Enclosed Wheel Guards meet safety regulations, can be adjusted radially or removed
- Adjustable Tool Rests and Spark Shields
- Toggle Switches and Rubber Feet
- All bench grinders can be equipped with pedestals

*For increased clearance.



ELECTRIC DRILLS

ELECTRIC SAWS

by Black & Decker in *Performance*

Black & Decker Bench Grinders are standard equipment in countless shops and plants all over the country. They've got the *design* for quick, easy work on large and odd-shaped pieces. They've got the *speed* for tool sharpening, wire brushing, buffing and polishing. They've got the *power* and *torque* for heavy-duty grinding and general shop work.

That's because each part in every Black & Decker Tool is specifically designed and made for the job it has to do. For example, Black & Decker uses no *stock* motors. The motor in any Black & Decker Tool is engineered and built completely by Black & Decker—to deliver maximum efficiency and performance in that particular tool.

Engineering leadership and precision workmanship have made Black & Decker the world's largest manufacturer of Portable Electric Tools. And those same qualities explain why any Black & Decker Tool gives you more service, more efficiency, more downright satisfaction.

Next time you need electric tools, or help on any tooling problem, call your nearby Black & Decker Distributor. The Black & Decker Mfg. Co., 716 Pennsylvania Ave., Towson 4, Maryland.

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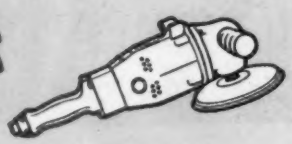
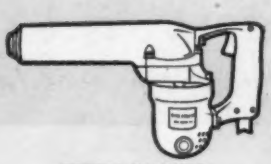
PORTABLE ELECTRIC TOOLS

PORTABLE GRINDERS



ELECTRIC SANDERS



ELECTRIC HAMMERS

WHIRLWINDS
for High-Speed Work

These Black & Decker Brushes have each tuft of wire held by a patented lock—separately, securely! Sizes: 4" to 12". Three brush widths. Three sizes of wire.

Courtesy of

GEORGE LASH CO.

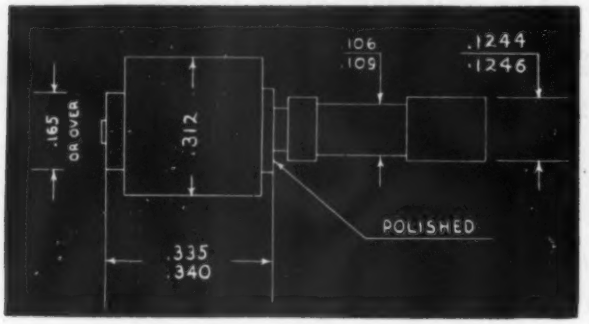
455 West 45th Street, New York, N. Y.

Specialists in machining of small precision parts

PRODUCTION DATA

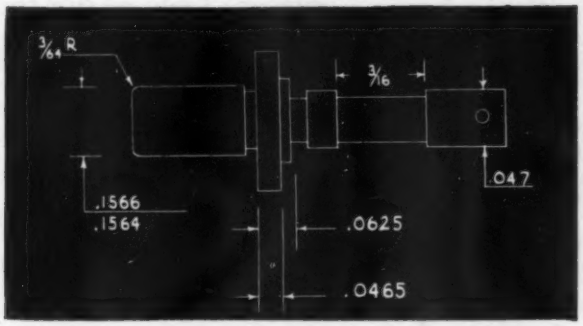
NICKEL ALLOYS

Focal pin for aircraft instrument part, machined at high speed from machining quality "R" Monel



FIRST OPERATION

Operation	Spindle R. P. M.	Surface Feet P. M.	Depth of Cut	Feed per Rev.—Inches	Tools
1st Box Tool	2000	165	.093	.003	Rexalloy
Form	2000			.0005	H. S. Steel
2nd Box Tool	6000	200	.00075	.001	Carboloy No. 883
Cutoff	2000	165		.002	H. S. Steel



SECOND OPERATION (Hopper Feed)

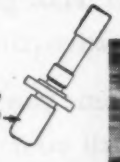
Operation	Spindle R. P. M.	Surface Feet P. M.	Depth of Cut	Feed per Rev.—Inches	Tools
1st Box Tool	2000	165	.077	.003	Rexalloy
Form	2000			.001	H. S. Steel
2nd Box Tool	5000	200	.00075	.001	Carboloy No. 883

MATERIAL: 5/16" rounds of "R" MONEL.

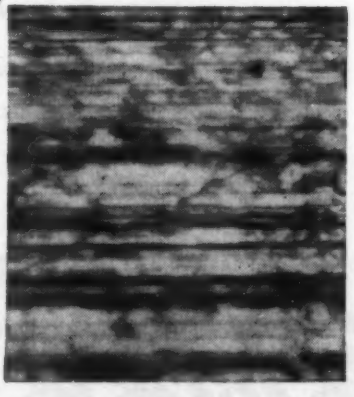
MACHINES: Brown & Sharpe Automatic Screw Machines, 00G.

LIFE OF TOOLS: 8 to 12 hours.

CUTTING LUBRICANT: Texas Oil Co., Cleartex "B".



Approximate location of surface shown in micro-photograph.



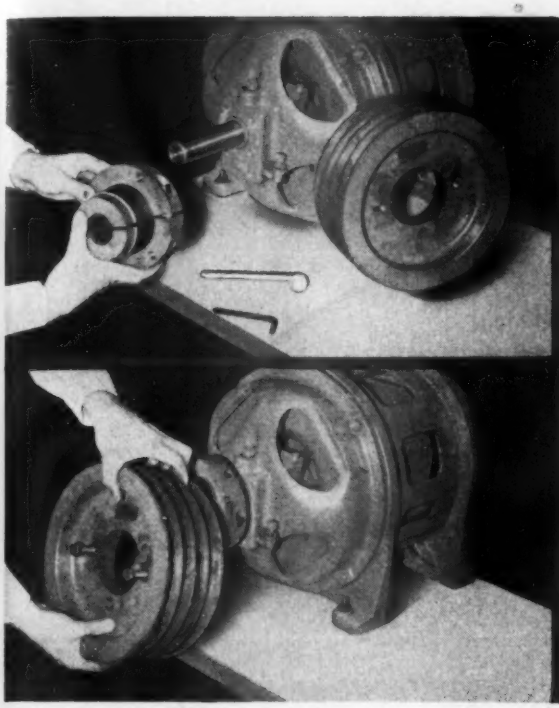
"R" MONEL MACHINED SHANK, MAGNIFIED 1000 TIMES. Good surface finish on this piece is indicated by a Brush Surface Analysis of 9.2 micro-inches.

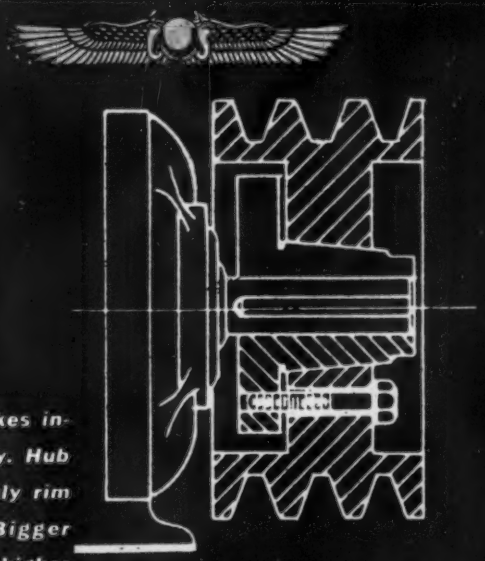
Write for INCO Technical Bulletin T-12, "Machining"...

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street, New York 5, N. Y.

NO OTHER SHEAVE HAS THESE 3 ADVANTAGES





Split hub makes installation easy. Hub stays put—only rim is changed. Bigger pull-up bolts—higher taper cone pressure.

Worthington's QD Sheave is easy to get on, easy to get off, yet always tight on the shaft

If you have ever been in the shop when old-fashioned sheaves were being changed . . . saw workmen sledging and prying and sweating to get one off and another on . . . got an earful of loose fits, tight fits, misalignment, then you'll appreciate these advantages of Worthington's QD sheaves.

With the QD, the hub stays put, because a variety of sizes of rims fit it. When changes are made for different speeds, the rim is easily removed and replaced. On all other sheaves, the hub has to be loosened, presenting a realignment problem when the hub is drawn up to the rim. Once you put on the hub of the QD sheave, alignment problems are permanently solved.

These advantages, plus those of the Worthington-Goodyear Endless Cord V-Belts, make the Worthington Multi-V-Drive the most trouble-free method of driving by V-belts.

Stock size sheaves and belts are available at strategic centers throughout the country.

SELECT A MULTI-V-DRIVE THE WORTHINGTON WAY with this simplified, easy to handle Master Manual

You can select the right drive to fit your job exactly in three minutes by the watch—using just plain everyday arithmetic.

Scientifically evaluated, after years of laboratory tests, all factors affecting V-Belt life and V-Belt efficiency were taken into consideration so that each selection is guaranteed to give peak performance under all conditions for which it is recommended.

This 72 page indexed manual does your Multi-V-Drive engineering for you. Be sure to get your personal copy.

Mail in the coupon below now.

MV4-11

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Please send me a copy of the Worthington Master Manual.

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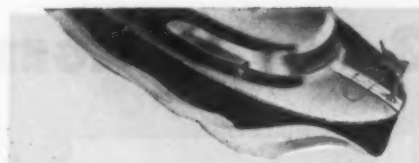
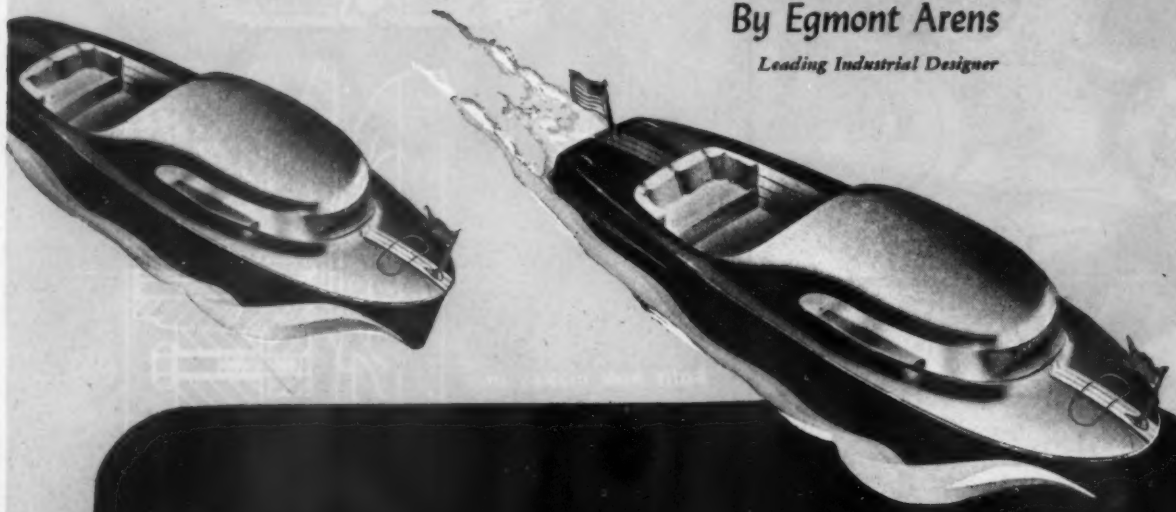


I PREDICT . . .

By Egmont Arens

Leading Industrial Designer



I predict quantity production, right after the war, of unsinkable boats with continuous skins, tougher and lighter than wood, hull and top sides molded in one piece of Co-Ro-Lite, a new molding material consisting of plastic-bonded rope fibres. Scale models of such boats are now being tested under a variety of conditions, and hulls of similar construction up to 32' have already been successfully molded. Light weight, speed and low cost will be overall outstanding features. The skin-stressed monocoque construction produces a light weight hull and top. An aluminum aircraft-type engine, housed out of the way in a small space under the aft deck, will provide speed and low operating expenses. Production by molding assures low initial cost, and a one-piece hull, eliminating yearly overhaul and caulking, means low upkeep. Thus motor-boating will be a pleasure everyone can buy with their War Bonds when Peace is restored.

* * *

Note: The Weatherhead Company, one of the oldest and most important manufacturers of parts for the aviation, marine, automotive and other key industries, looks forward to the day when its four plants will be contributing to peacetime needs.

Look Ahead with

Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND, OHIO

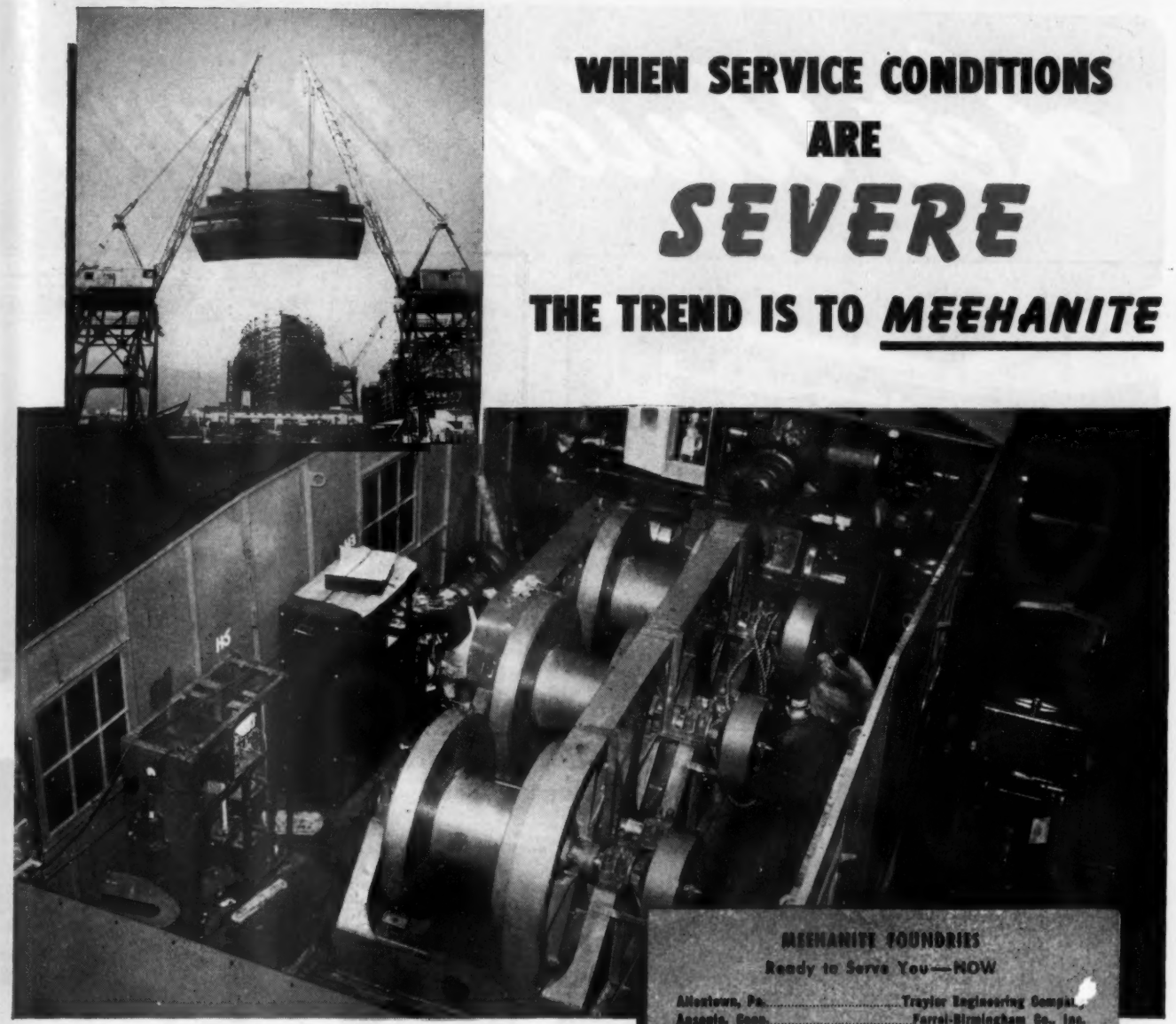
Manufacturers of vital parts for the automotive, aviation, refrigeration and other key industries.

Plants: Cleveland, Columbia City, Ind., Los Angeles
Canada—St. Thomas, Ontario

FREE: *Write on company letterhead for "Seeds Of Industry"—a history of The Weatherhead Company, its many facilities and diversified products.*

WHEN SERVICE CONDITIONS ARE *SEVERE*

THE TREND IS TO *MEEHANITE*



In the control houses of these traveling gantry revolving cranes built by Washington Iron Works, Seattle, MEEHANITE CASTINGS are used for *1. Hoist Drums; 2. Air Friction Control Cylinder; 3. Air Friction Control Pistons.*

The hoist drums, operating under the severe conditions imposed by steel cables have been found to provide greater resistance to wear and scuffing. Pistons and cylinders are typical Meehanite applications resulting in greater service life,—smoother operation.

Metallurgically Meehanite is different from most other irons in that it is manufactured from a different compositional base and with methods permitting close control of the metal structure. As a result, engineering properties combine to provide high tensile strength, a practical machinable hardness, good anti-friction and vibration damping properties, toughness, resilience and uniformity of grain structure in varying dimensions.

WRITE FOR the Specification Wheel Chart. It tells you what you can get with MEEHANITE.

Meehanite Quality Control Assures Uniform Dependability

MEEHANITE RESEARCH INSTITUTE
NEW ROCHELLE, N. Y.

MEEHANITE FOUNDRIES
Ready to Serve You—NOW

Allentown, Pa.	Traylor Engineering Compan
Ansonia, Conn.	Farrel-Birmingham Co., Inc.
Birmingham, Ala.	The Continental Gin Co.
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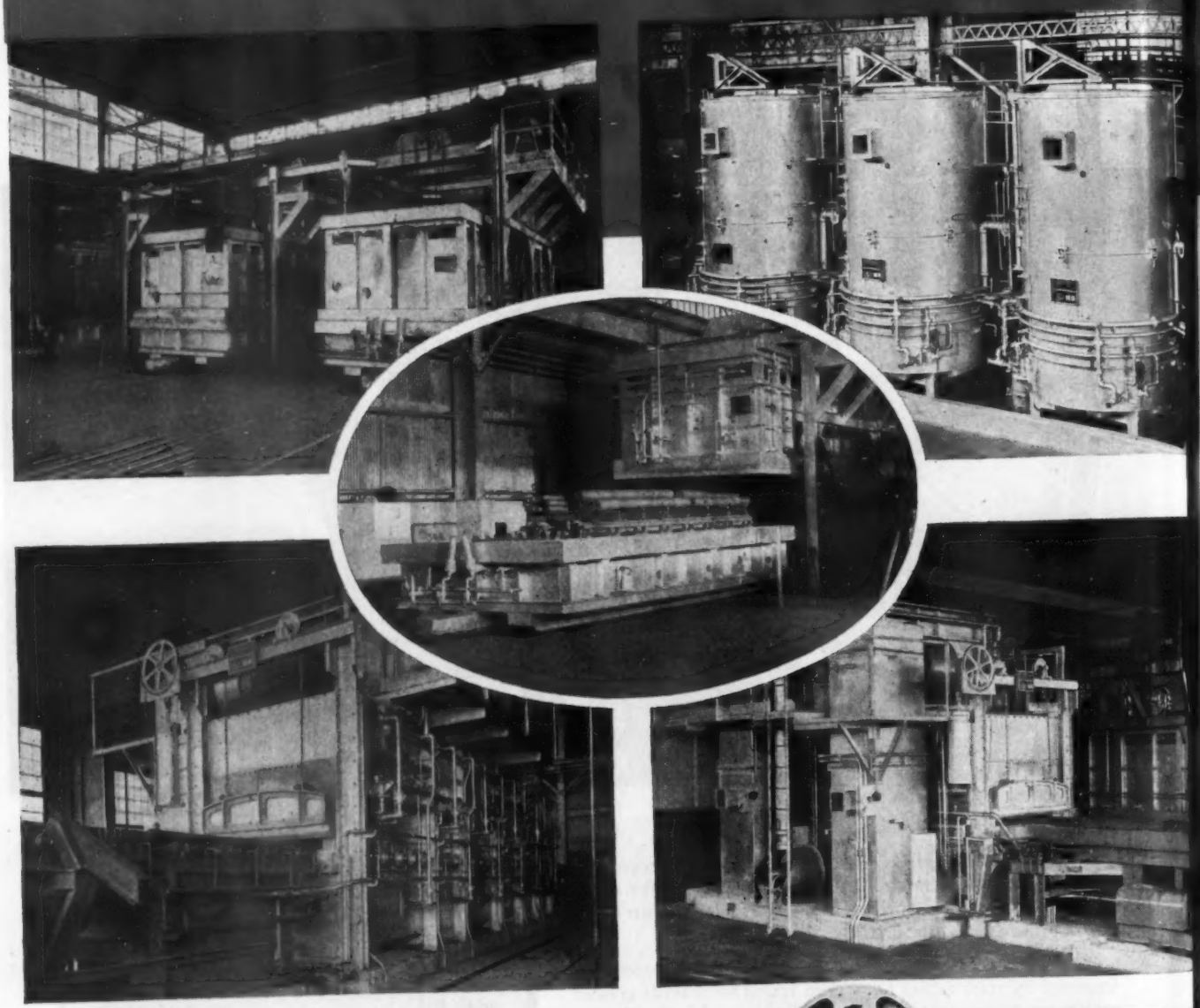
Brooklyn, New York	E. W. Bliss Company
Buffalo, N. Y.	Pohlman Foundry Co., Inc.
Charleston, W. Va.	Kanawha Manufacturing Co.
Chattanooga, Tenn.	Ross-Meehan Foundries
Chicago, Ill.	Greenlee Foundry Company
Cincinnati, Ohio	Cincinnati Grinders Incorporated
Cincinnati, Ohio	The Cincinnati Milling Machine Co.
Cleveland, Ohio	Fulton Foundry & Machine Co.
Denver, Colo.	The Stearns-Roger Mfg. Co.
Detroit, Mich.	Atlas Foundry Co.
Flint, Mich.	General Foundry & Mfg. Co.
Hamilton, Ohio	The Hamilton Foundry & Machine Co.
Hamilton, Ontario	Otis-Fensom Elevator Co., Ltd.
Irvington, N. J.	Barnett Foundry & Machine Co.
Jeannette, Pa.	Elliott Company
Los Angeles, Calif.	Kinney Iron Works
Milwaukee, Wis.	Keehring Company
Mt. Vernon, O., Grove City, Pa.	Cooper-Bessemer Corporation
New York, N. Y., Mahwah, N. J.	The American Brake Shoe Co.
Oakland, Calif.	Vulcan Foundry Company
Orillia, Ontario	E. Long, Ltd.
Philadelphia, Pa.	H. W. Butterworth & Sons Co.
Philadelphia, Pa.	Florence Pipe Foundry & Machine Co. (R. D. Wood Company, Selling Agents)
Phillipsburg, N. J.	Warren Foundry & Pipe Corp.
Pittsburgh, Pa.	Rosedale Foundry & Machine Co.
Portland, Oregon	Crawford & Doherty Foundry Co.
Rochester, N. Y.	American Laundry Machinery Co.
St. Louis, Mo.	Banner Iron Works
St. Paul, Minn.	Valley Iron Works
Seattle, Washington	Washington Iron Works
Spokane, Washington	Washington Machinery & Supply Co.

Let Union Drawn



Republic

REPUBLIC STEEL — PRODUCTION FOR VICTORY

US

UNION COLD DRAWN STEELS

Free-Machining Bessemer, Open-Hearth and Electric Furnace Steels

•

Union Cold Drawn Special Sections

•

Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting)

Show You How

TO ATTAIN THE PHYSICAL PROPERTIES —HARDNESS—MACHINABILITY

you desire in cold drawn steels . . . through furnace treatment

● If you have been using Republic Union Cold Drawn Steels, you are well aware of the uniformly higher physical properties, the greater hardness and the improved machinability which can be obtained from the cold drawing process.

And, if you have been using such steels when furnace treated, you readily can appreciate the improvement in physical properties and hardness made possible by heat treatment.

Machinability can be substantially improved, too, by furnace treatment, especially in the higher carbon types of steel and where unsymmetrical machining might result in warpage or distortion.

Through increases in the furnace capacity in all of its plants, Republic Union Drawn Steel Division now is ready to supply your every need in furnace treated cold drawn steels—annealed, normalized, spheroidized, stress relieved and otherwise heat treated.

The most modern pit-type recirculating furnaces provide for treatment of coiled stock. Types for the treatment of bars include both continuous roller hearth recirculating furnaces and car bottom furnaces heated by radiant tubes. Facilities also provide for furnace treatment in prepared atmosphere —thus preventing decarburization.

Union Drawn metallurgists are ready to sit down with you and discuss the benefits of furnace treated cold drawn steels as applied to your product. Their unusually wide experience qualifies them to recommend the most efficient and most economical grade of Union Cold Drawn Steel for each of your specific uses—and to show you how you can further benefit by having that steel furnace treated.

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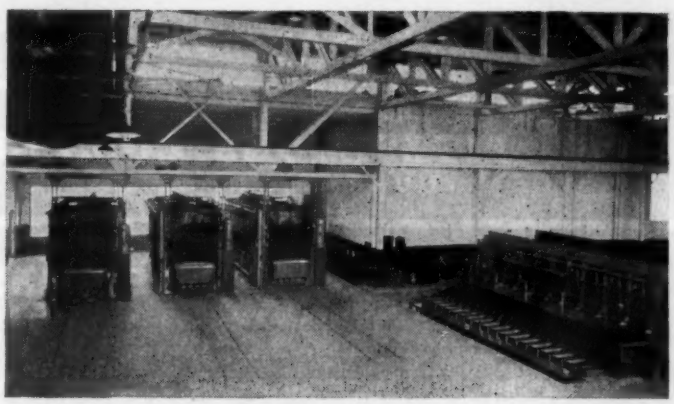
GENERAL OFFICES • • CLEVELAND 1, OHIO
Berger Manufacturing Division • Culvert Division
Niles Steel Products Division • Steel and Tubes Division
Truscon Steel Company
Export Department: Chrysler Building, New York 17, N. Y.



The photos on this and the opposite page show a few of the many modern furnaces installed in Republic Union Drawn plants in Massillon, Gary, Beaver Falls and Hartford since the beginning of the war.

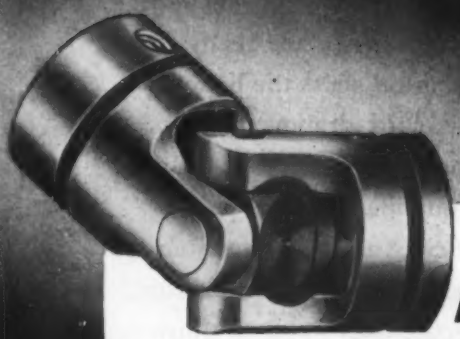
More Parts for Less Mean Larger Profits

SPEED CASE STEEL

A LOW CARBON OPEN HEARTH PRODUCT

INCREASED PRODUCTION

- High Speed Machining
- Heavier Cuts
- Good Finish
- Increased Tool Life



If you wrote your own specifications for the ideal, all purpose, open hearth carburizing STEEL, it would be . . .

SPEED CASE!

More Parts Lower Cost!

Parts on this Universal Joint were machined at 220 S.F.P.M., drilled with a .012" feed, cross milled with a .010" cut and forming tool with a .004" feed. Even with these excessively deep cuts and with machining stepped up to 220 S.F.P.M., tool life was increased *THREE* times over S A E X1020. Estimated savings, $49.50 per ton of steel used. TRY SPEED CASE for Increased Production, lower costs.

Write for SPEED CASE CATALOG *showing savings of 20 to 65%.*

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Licensee for Eastern States

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MONARCH STEEL COMPANY

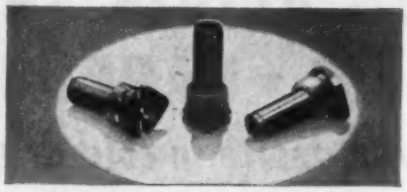
HAMMOND · INDIANAPOLIS · CHICAGO

PECKOVER'S LTD. Toronto, Canadian Distributor

MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

PRECISION PARTS

GRINDING OUT MESSAGES FOR G. H. Q.



. . . mass-production with accuracy . . .

Teletype, that miraculous contrivance that writes out a message hundreds of miles away as fast as the sender can type at the other end, plays a leading role in vital operations. These little pieces, ground to close tolerances by Ace, are an important part of the teletype machine.

From rough-machined and hardened blanks, Ace grinds and hones the inside diameter. Then, locating from this diameter, they cylindrical grind the two outside diameters and faces, holding the shoulder lengths. Next, each piece is placed in a fixture and surface-ground on both sides of the slot. The center line of the slot and the center line of the bore are held to very close tolerances. Ace made the tools and gauges and engineered the entire finishing operations.

This is typical of Ace service and ingenuity from start to finish. Consult Ace on small precision-parts or assemblies calling for stamping, machining, heat-treating, or grinding. Send sample, sketch, or blueprint for quotation.

Keep a copy of this booklet in your post-war planning file. It will come in handy.

ACE

TRADE MARK

ACE MANUFACTURING CORPORATION

for Precision Parts

1207 E. ERIE AVE., PHILADELPHIA 24, PA.

Follansbee pre-forging for sound alloy steels

Wherever severe conditions put steels to the test—whether it be in transmission gears in heavy trucks and bulldozers, or in the landing struts of giant aircraft—Follansbee Pre-Forging demonstrates its value.

Follansbee, though it furnishes only the basic steel—from blooms to strip—brings the advantages of forging into the very first operation after the ingot is poured. Pre-Forging is the exclusive process which presses ingots into blooms and billets . . . imparts a uniform density and grain structure that can be relied upon, shipment after shipment.

For forgings—or for products requiring sheets and strip—Follansbee Pre-Forging and the skill of its compact organization assure the sound alloy steels that respond properly to your heat treating and working quality requirements.

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Sales Offices—New York, Rochester, Cleveland, Detroit, Milwaukee. *Sales Agents*—Chicago, Indianapolis, St. Louis, Nashville, Los Angeles, Toronto and Montreal, Can. *Plants*—Follansbee, W. Va. and Toronto, O.

ALLOY BLOOMS, BILLETS, BARS, SHEETS & STRIP • COLD ROLLED SHEETS & STRIP
POLISHED BLUE SHEETS • ELECTRICAL SHEETS & STRIP • SEAMLESS TERNE ROLL ROOFING

SECOMET
DIAMOND WHEELS

Resinoid-bonded for grinding of carbide-tipped tools in large quantities, or on a production basis. Their extremely fast cutting action provides rapid stock removal. Also for fixed feed, precision grinding operations, such as cylindrical, surfacing, internal and cutter grinding, because of their free and cool cutting action and ability to hold size.

Metal-bonded for off-hand grinding, where the cutting surface is sometimes subjected to extreme abrading action.

Made in all standard types and diameters, in diamond concentrations to suit your requirements.

Catalog on request.

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ALLOY STEELS FOR VICTORY

Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

Wheelock, Lovejoy & Co., Inc.

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Cleveland 14, Chicago 23, Newark 5, Detroit 3, Buffalo 10, Cincinnati 32

ROLL ON **ABBOTT** *Bearing* **BALLS**

they can "TAKE IT"!

If it's a job for a BEARING BALL—an intricate mechanism, an average assembly or an extremely heavy duty job where stamina is of vital importance—ABBOTT can take it. Specify "ABBOTT"

THE ABBOTT BALL COMPANY HARTFORD, CONN. U. S. A.

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made with "CONTROLLED METALS"

Maximum service from Auto-Lite Die Castings is assured by our application of "CONTROLLED METALS." Spectrographic analysis, metallographic studies, X-ray inspection, physical testing, heat treating, etc., are all combined into the production of Auto-Lite Die Castings. This rigid control, even when parts are of intricate design, assures uniform die castings which meet exacting specifications and serve more efficiently wherever applied.

The Auto-Lite Die Casting plant combines under one roof complete facilities for die casting, machining and finishing either from zinc or aluminum. Auto-Lite's wide experience, within the limits of today's wartime demands, is available in adapting and producing die castings to meet your individual requirements.

BUY WAR BONDS

THE ELECTRIC AUTO-LITE COMPANY

Alemite Die Casting Division

600 South Michigan, Chicago, 5 — **Woodstock, Illinois** — **723 New Center Building, Detroit, 2**

Why is this alloy called

Because MAGNOLIA ANTI-FRICTION is the most widely used of all babbitt metals for replacing worn bearing linings.

First placed "on the market" in 1886, MAGNOLIA ANTI-FRICTION METAL is a graphite-treated, self-lubricating alloy having the lowest coefficient of friction of any known bearing alloy — 300% lower than genuine babbitt. Service records prove its ability to absorb grit and dust and still provide an excellent bearing surface.

If you are not already familiar with MAGNOLIA ANTI-FRICTION METAL why not try it out? You can obtain a supply from your distributor . . . no priority required.

MAGNOLIA METAL CO.
18 West Jersey Street
Elizabeth 4, N. J.

MAGNOLIA METAL CO. OF CANADA, LTD.
2028 Manufacturers Street
Point Ste. Charles, Montreal

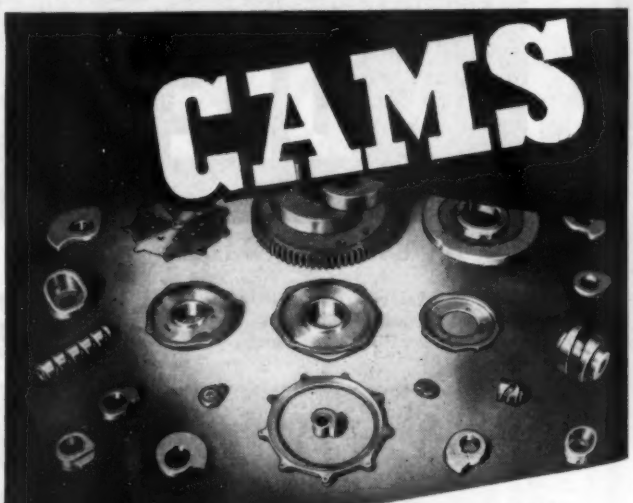
MAGNOLIA BEARING METALS

INTERCHANGEABLE BLANK COLLET JAWS. Keep a supply in the bin and drill them to fit the job. No waiting.

HERE'S the handiest idea ever put in a shop. Wayne Collet Chucking Fixtures use blank jaws. You drill to suit the job. No waiting . . . no special fixtures to build. Operates by air motor or hand . . . convertible any time. Write for bulletins now!

THE WAYNE PUMP COMPANY
FORT WAYNE 4, INDIANA

Distributed by The Bellows Co., Akron 15, Ohio, U. S. A.



LET the largest, most completely equipped cam milling and grinding plant in the mid-west handle your cam problems. All sizes of drum, face, groove or other styles of cams cut to order in quantities of one or one thousand. Send specifications or blueprints for a quotation on your requirements.

KUX MACHINE COMPANY
3924-44 W. HARRISON ST.
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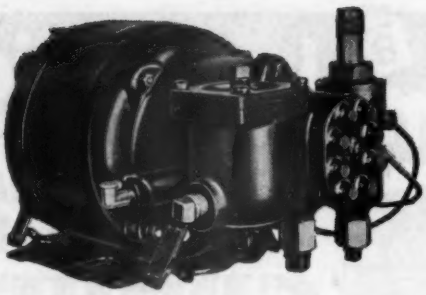
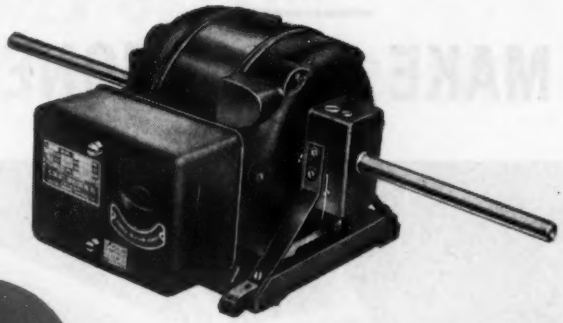




HOLTZER-CABOT

SPECIAL FRACTIONAL HP MOTORS DESIGNED TO FIT THE APPLICATION

If operating characteristics, speeds, hazards, ambients, etc., were always similar for products . . . standard "off-the-shelf" motors could be used for most cases. However, experience proves that operating conditions do vary in motor applications — and the only way to meet performance requirements is to use a special motor specifically designed to meet operating conditions such as load cycle, speed stability, speed control, reversal of rotation, atmospheric conditions, quietness, etc.

For over 50 years Holtzer-Cabot has concentrated its facilities in the design and application of special fractional HP motors to meet the exacting performance requirements of such products as instruments, aircraft, machine tools, business machines, etc. And although today all of our energies are being utilized in building motors for military products, our motor development engineers will gladly discuss your peace-product motor problems with you.

HOLTZER-CABOT

THE

HOLTZER-CABOT ELECTRIC COMPANY

Designers and Builders of Special Fractional HP Motors and Electrical Apparatus

125 AMORY STREET, BOSTON 19, MASS.

New York, N. Y. • Chicago, Ill. • Philadelphia, Pa.

LET LESS METAL MAKE MORE MONEY

It's expensive to hold a mechanism in place with unnecessarily big shoulders or collars,—or to temporize with small cotter pins, etc. Let us show you how spring steel retaining rings can do a thoroughly efficient job for you.

More and more retaining rings are being used in these days of necessary economy. Every ounce of metal and every cent of cost is more important today than ever before.

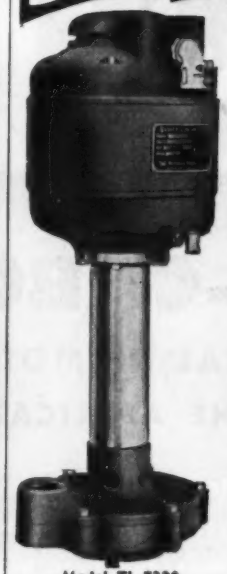
It is needless waste in most instances to turn your shoulders by cutting down larger shafts, when you can groove a smaller shaft and apply a spring steel retaining ring. You'll get excellent results at unbelievable savings.

Every shoulder on your machines or on your metal products should be examined to see whether or not smart engineering could take advantage of these modern artificial shoulders on shafts or in housings.

Write today for our descriptive folder on Retaining Rings.

THE NATIONAL LOCK WASHER COMPANY
Newark, N.J., Milwaukee, Wisc., U.S.A.

Simplest Design MINIMUM MAINTENANCE GUSHER COOLANT PUMPS



Model TL-7320.
See Section 2 of new catalog, indexed for quick reference.
Gusher Pumps Patented and Patents Pending.

Plant records of some of the country's largest factories show that Gusher Coolant Pumps require minimum maintenance. This is due to the simple design, with few parts and no bearings within pump itself, elimination of all packing nuts, no metal-to-metal contact, no relief valves. The result is less friction, less wear, longer life, minimum maintenance. From a dribble to 200 g.p.m., with no leakage — 1/30 to 2 H.P., there is a Gusher model and type for your special needs.

Write for catalog.

THE RUTHMAN MACHINERY CO.
1809 READING ROAD CINCINNATI 2, OHIO
The "Gusher"—A Modern Pump for Modern Machine Tools

Tuthill V-BELT PUMP UNIT MAKES LIGHT WORK OF HEAVY LIQUIDS

For efficient handling of viscous liquids, this compact V-belt driven Tuthill pumping unit is outstanding. Quiet in operation. Simple in construction. Built for long service with negligible maintenance. Features include internal gear rotary pumps, outboard ball-bearing shaft support, belt tension adjustment by one set-screw, wide range of speeds, capacities and pressures. Write for viscous liquid pump bulletin.

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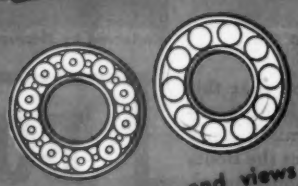
TUTHILL SERVING ARMY NAVY • AIR FORCE MERCHANT MARINE

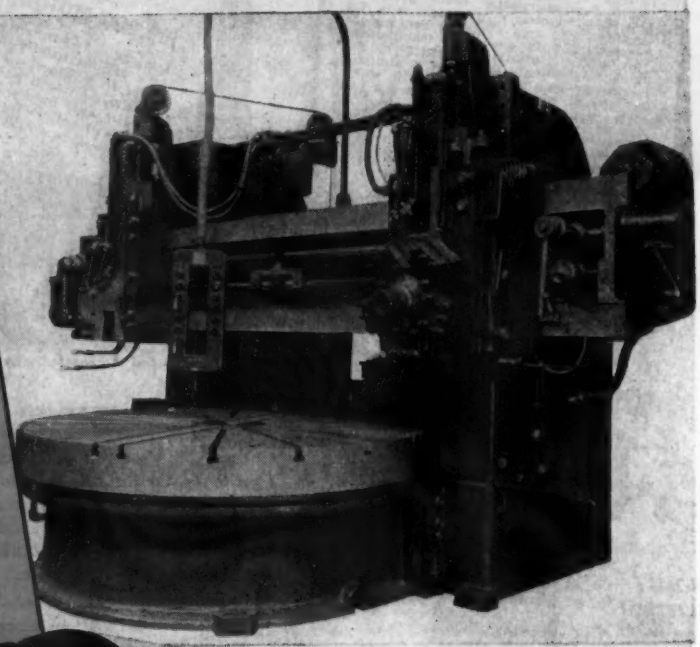
TUTHILL PUMP COMPANY
939 E. 95th ST. • CHICAGO 19, ILLINOIS

THIS STAGGERED ROLLER DESIGN

PROVIDES GREATER LOAD CARRYING CAPACITY

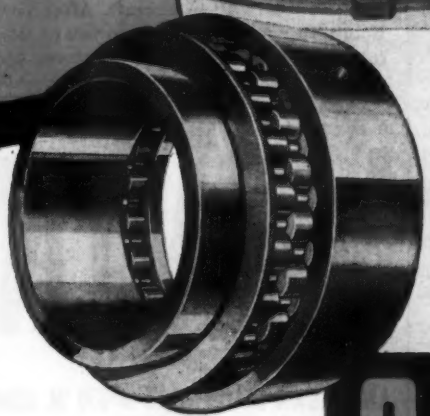


Shown above are end views of an Orange Staggered Roller Bearing and a conventional roller or ball bearing. Note how staggered design brings maximum roller surfaces in contact with load.



Above: 100" BETTS BORING MILL

manufactured by Consolidated Machine Tool Corporation, uses Orange Staggered Roller Bearings in the feed mechanism, where high load carrying capacity and smooth, even running are vitally important.



The fact that Orange Staggered Roller Bearings do the work of larger-size conventional roller bearings, gives you several valuable advantages in the design and construction of your products:

1. Design your *new* equipment to carry the desired load with smaller-size bearings, saving space, weight and cost.

2. Replace bearings in *present* equipment with same-size Orange Staggered Roller Bearings, to gain additional load capacity, safety margin and service life.

In Orange Staggered Roller Bearings, many short rolls distribute the load over a multiplicity of contact points, providing maximum supporting area and smooth, precision running. Available in a full range of standard, interchangeable sizes. Special sizes made to order. Send for detailed Engineering Data Book showing design, dimensions, capacities, installation data, etc.

ORANGE "STAGGERED" ROLLER BEARINGS

Mail Coupon for Engineering Data

Orange Roller Bearing Co., Inc., AM
Orange, N. J.

Please send me your Staggered Roller Bearing Data Book

Name..... Title.....

Company.....

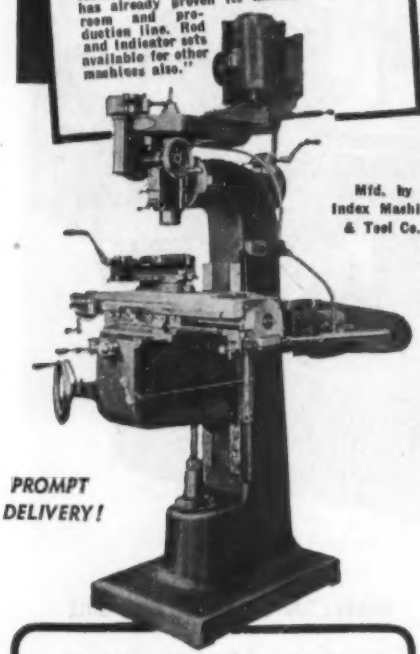
Address.....

City..... State.....

ORANGE ROLLER BEARING CO., INC.
554 Main Street, Orange, N. J.

NOW! INDEX MILLS EQUIPPED WITH RODS & INDICATORS

"We are pleased to announce a rod and indicator set available for installation on Index Mills, either new at the factory, or used machines already in the field. Set consists of two indicators graduated in .0001" two micrometer heads graduated in .0001", necessary precision rods for locating in an area 8" x 16", and troughs for holding rods across and longitudinal. This makes it possible for you to obtain, at an astonishingly low price, a precision locator as well as a vertical mill which has already proven its merits in the tool room and production line. Rod and indicator sets available for other machines also."



Mfd. by Index Machine & Tool Co.

PROMPT DELIVERY!

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.

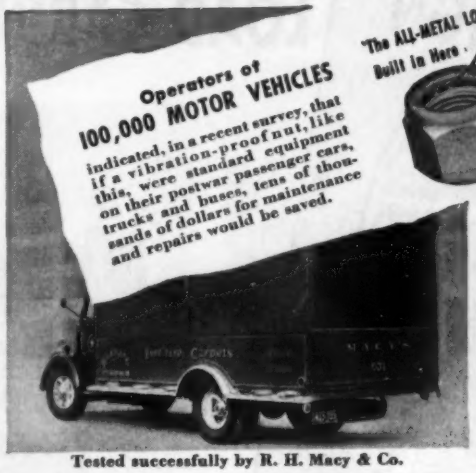
A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICH.

"Periodic Re-tightening NOT Necessary with BOOTS NUTS," *say leading fleet operators*


Operators of
100,000 MOTOR VEHICLES
indicated, in a recent survey, that if a vibration-proof nut, like this, were standard equipment on their postwar passenger cars, trucks and buses, tens of thousands of dollars for maintenance and repairs would be saved.
"The ALL-METAL LOCK is Built In Here"

Tested successfully by R. H. Macy & Co.

Proved invaluable by United Parcel Service

Endorsed by Metropolitan Distributors, Inc.

ACTUAL service tests have proved that this nut *can't* shake loose. With its built-in all-metal lock, the Boots Nut defies vibration. Once it locks itself in place, it *stays* tight! Yet the Boots Nut can be adjusted or removed, and re-used, time and time again. And, being *all metal*, Self-Locking Boots are not affected by oil, gasoline, temperature or weather.

For the duration, Boots' entire output must be reserved for military aircraft. After victory, the Boots Nut will be available to you to assure fewer repairs and better all-round performance.

BOOTS
SELF-LOCKING NUTS
"There's No Excuse for a Nut Shaking Loose"
Boots Aircraft Nut Corporation
General Offices, New Canaan, Conn.

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If you plan to change the address to which your copies of AMERICAN MACHINIST are sent, let us know now. We don't—and we're sure you don't—want a single issue to be delayed in reaching you. Coupon below is for your convenience.

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MY OLD ADDRESS

Name .....

Title .....

Company .....

Address .....

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Name .....

Title .....

Company .....

Address .....

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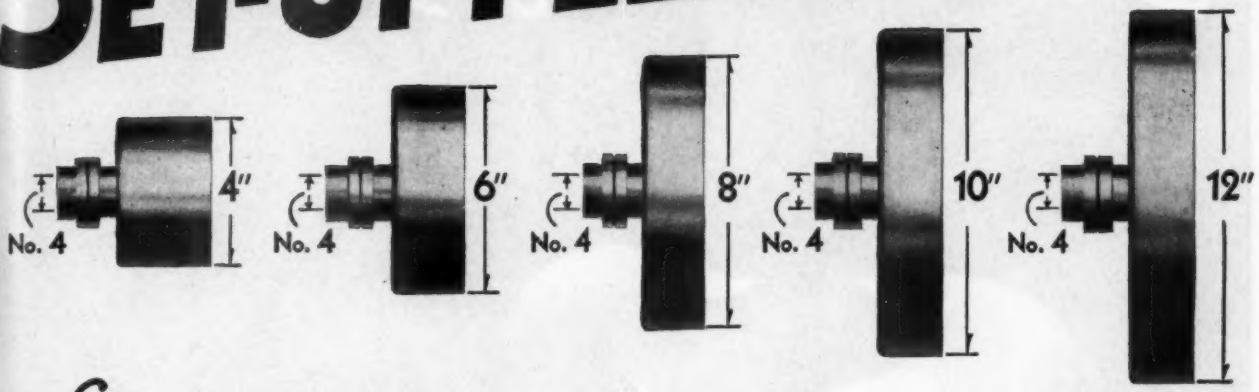
SET-UP FLEXIBILITY



for POLISHING . . . BURRING *or* LAPPING . .

SINGLE SIZE TAPERED SPINDLE ON ALL LATHES

USE LIMA MAGNETIC POLISHING LATHES...

"Set-Up Flexibility" of these lathes is the combining of interchangeable magnetic chucks, face plates and register plugs to hold work in polishing, burring, lapping, or similar operations. In designing this lathe, broad adaptability of standard and special size chucks for quick changes in set-up was one of the primary objectives of Lima Engineers. To accomplish this, and to retain the positive operation of direct drive, the motor shaft was employed as the chuck spindle. This shaft which is of standard diameter on all lathes permits the application of different size chucks to one lathe. These chucks are interchangeable between lathes, where more than one unit is employed.

All Lima Magnetic Chucks are taper mounted on the motor shaft; it is a very simple operation to remove one size chuck and replace it with another size. The operation requires only a few moments of time. These lathes can be used for processing work from 7/8" outside diameter up, and can be used either as single units or in a battery of units in a production line.

Many other features for rapid handling of parts and pieces in polishing, burring or lapping operations are incorporated in this Lathe. Why not learn more about Lima Magnetic Polishing Lathes now? Wire or write today for bulletin describing this unit in detail. It may be just the machine to do your job.

Manufactured by

The LIMA ELECTRIC MOTOR Company
1508 Findlay Road
LIMA, OHIO, U. S. A.

MAGNETIC POLISHING LATHES . . . GEARSHIFT DRIVES . . . PEDESTAL GRINDERS . . . ELECTRIC MOTORS

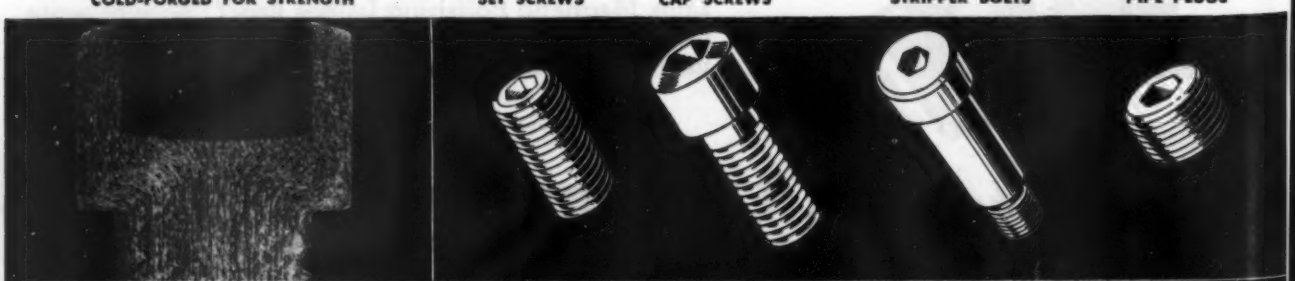
Start RIGHT .... *Seat* RIGHT

PARKER-KALON SOCKET SCREWS

Parker-Kalon's Quality-Control rules out trouble in starting and seating P-K Cold-forged Socket Screws. Threads MUST be clean cut and free of nicks and burrs. They MUST be accurately formed and true to pitch and lead. Heads MUST be concentric with the shank and the diameter held to close tolerances.

Starting when raw material enters the P-K plant, and ending only when the finished screws are packed. the P-K Quality-Control routine checks every mechanical and physical characteristic. Tests and inspections cover Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Torsion and Shear; Hardness; Head and Socket Size and Position; Thread Fit. Parker-Kalon Corp.. 208 Varick St., New York 14.

COLD-FORGED FOR STRENGTH | SET SCREWS | CAP SCREWS | STRIPPER BOLTS | PIPE PLUGS



A Product of **PARKER-KALON**--*Specialists in Fastening Devices*

● The next time you need bearing bronze call your local Johnson Distributor. He features "One-Stop-Service." This includes Johnson UNIVERSAL Bronze Bars—over 350 sizes; General Purpose Bearings—over 850 sizes; Electric Motor Bearings—over 250 types . . . plus Johnson Babbitt; Ledaloyl, self-lubricating bearings and Graphited Bronze.

Thus by selecting one dependable source of supply you can secure every item you need in sleeve type bearings for either maintenance or repair. And every item of Johnson Bronze manufacture is the highest quality available.

In normal times your local Johnson distributor can make immediate deliveries—from stock. The demands of the present war have curtailed prompt deliveries—but he will do his best to give you reasonable service. The most practical plan is to anticipate your requirements as far in advance as possible. Then you will be assured of having your bronze when you need it.

Plus...

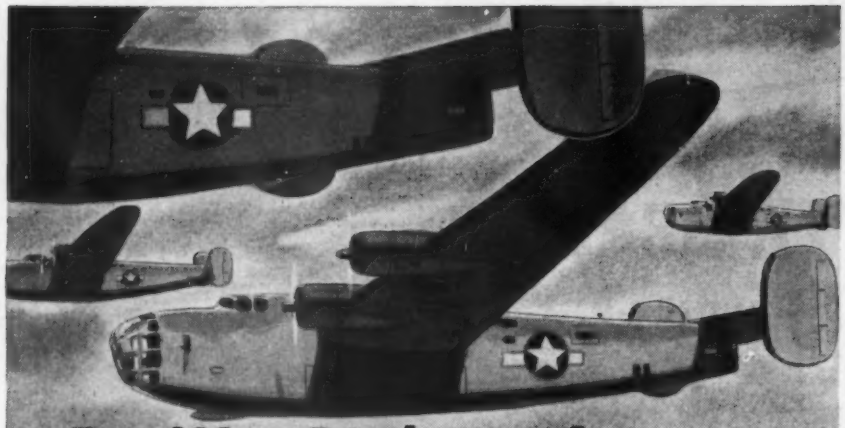
Ledaloyl—self lubricating bearings
Babbitt—lead or tin base
Graphited Bronze Bearings

JOHNSON BRONZE

SLEEVE BEARING HEADQUARTERS

The MOST COMPLETE SLEEVE BEARING SERVICE in the WORLD

515 S. MILL STREET NEW CASTLE, PA.



For War Birds . . . for your Peacetime Products

. . . the same extra endurance, extra margin of safety—with Ampco Metal Parts

Your nearest Ampco field engineer can help you . . .

Many pre-war standards of mechanical performance are obsolete today. The success of your post-war products depends on keeping pace with such wartime developments as the wider use of Ampco Metal production parts . . . By using this superior alloy of the aluminum bronze class at critical points — where there is wear, impact, or corrosion — you get several times the life of ordinary bronzes, and avoid failures, breakdowns, costly repairs and interruptions of service. Get the benefit of Ampco's extensive war experience by consulting the nearest Ampco field engineer — let us engineer your specific applications. Call or write today.

Ampco Metallurgical Specialties

Ampco Grades 12 to 22 (special alloys of the aluminum bronze class) . . . Ampcoloy (general industrial bronzes) . . . Special Custom Copper-base Alloys. Sand Castings . . . Centrifugal Castings . . . Extruded and other Wrought Products . . . Precision-machined Parts . . . Ampco-Trode (coated welding electrodes) . . . Ampco Non-Sparking Safety Tools.

Valuable data free for builders and users of: Machine Tools . . . Aircraft . . . Pumps and Valves . . . Engines . . . Ordnance . . . Ships . . . Heavy Machinery . . . etc., etc.

Photographs—engineering data sheets—tables of properties — etc. Write today.

A-4

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AMPCO METAL, INC.
Dept. AM-7A, Milwaukee 4, Wisconsin

Please send your new catalog 23 and File 41 of Engineering Data Sheets.

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Metal

The Metal without an Equal

HELPFUL INFORMATION FOR TRAINING NEW WORKERS ON MILLING OPERATIONS

A 16-page, illustrated, practical training course on milling. The beginner coming to the shop from non-industrial life or the candidate for up-grading from some simpler shop operation will find here background information about the machines and tools he will use, how they should be handled, what he can do with them.

Appearing originally in *American Machinist* as No. 3 in the series of special training sections on "Tools of Our Trade", the demand for this feature in reprint form clearly indicates the value placed upon it.

Send for the number of copies you need while they are still available. Price 10c each; less in lots of 500. Use coupon below.

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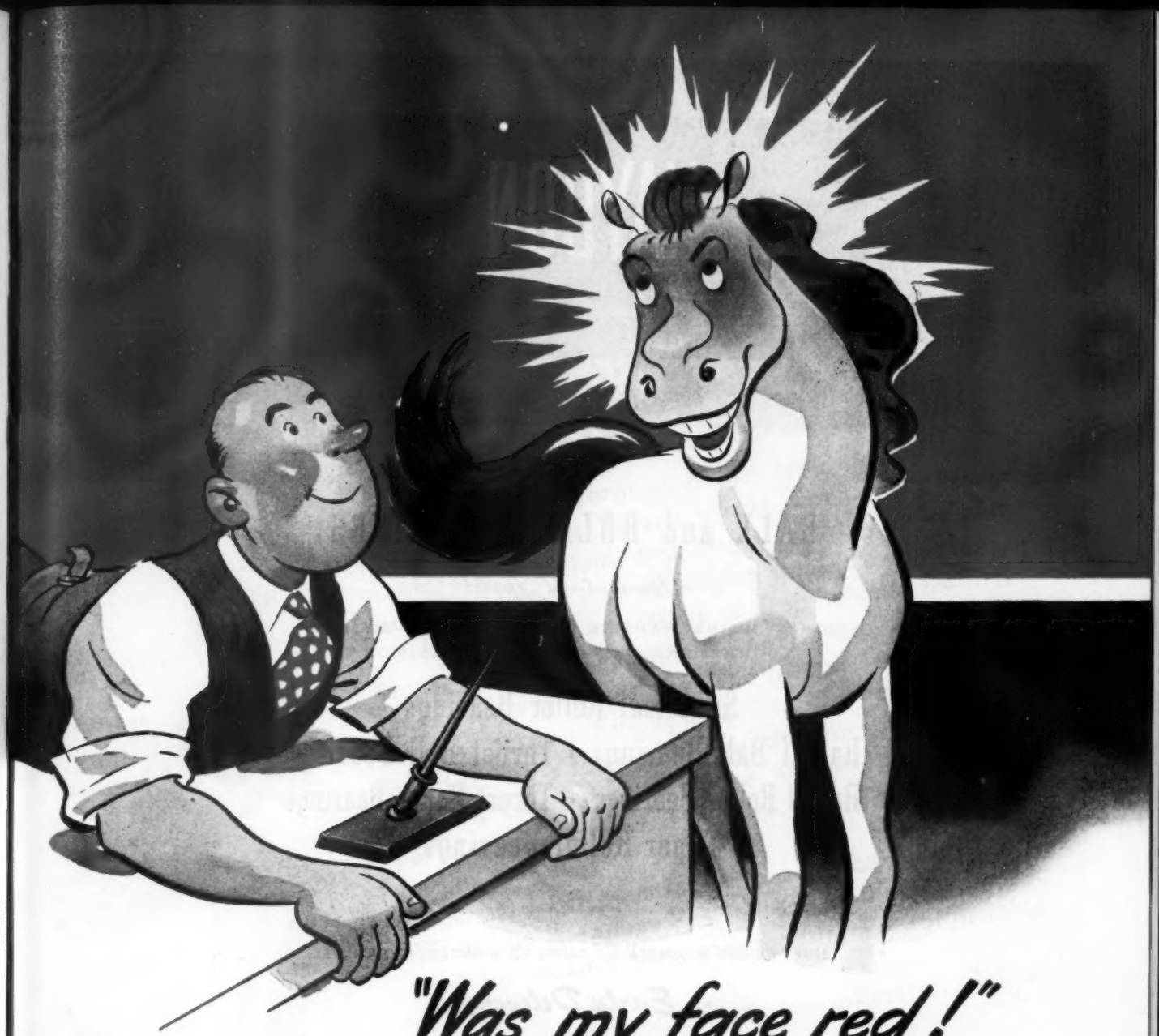

"Was my face red!"

The Howell Protected Type Motor, shown, gives complete protection against dripping liquids, metal chips and other falling particles. Completely streamlined — utilizing non-breakable steel frame — malleable or steel base — cast iron end plates and cast iron, weatherproof terminal box are standard construction features. Special horizontal and vertical mountings are available.

Available in sizes 5 H.P. and smaller.

HORSE: Mr. Manufacturer, I'm representing Horsepower by Howell. I want to save you trouble, save you time and save you money.

MANUFACTURER: That's a big order. You better be sure of your ground.

HORSE: Exacting, eh? That's the kind of customers we like to sell. You see we build a complete line of standardized motors and we also build special motors for special jobs.

MANUFACTURER: Yes, yes, go on.

HORSE: You know it's much more efficient and economical to get a motor with exactly the electrical and mechanical characteristics required to perform your specific job —

MANUFACTURER: Yes, I know. I am a Howell user — and a Howell booster, too . . . You built my motors more than 10 years ago.

HORSE: Put 'er there, brother, we agree! But don't wait so long to tell me the next time that we see eye to eye on electric motors. The suspense makes my face red. Still, it's gratifying to know that so many shrewd buyers specify Horsepower by Howell and like it.

HOWELL ELECTRIC MOTORS COMPANY

HOWELL, MICHIGAN

Manufacturers of Quality Motors Since 1915

Contact **KAYDON** of Muskegon

For Unusually Large, High Precision Bearings

BALL and ROLLER BEARINGS

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FROM 6" INSIDE DIAMETER TO 100" OUTSIDE DIAMETER
COMMERCIAL FINISH OR ULTRA-PRECISION

Spherical Roller Bearings
Radial Ball Bearings • Thrust Ball Bearings
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Straight or Self-aligning . Extra Heavy Duty or Special Light Type

LIGHT WEIGHT NON-METALLIC CAGES OR STANDARD BRONZE TYPE

★ *Early Delivery* ★

PRECISION MACHINE WORK OR GRINDING

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For excellence in production of extremely precise, unusually large ball and roller bearings

THE KAYDON ENGINEERING CORP.

McCRACKEN STREET • MUSKEGON, MICH.

New in Name . . . Old in Experience

DROP FORGINGS NOW!

If you need drop forgings of the type illustrated — gear blanks, cams, levers, cranks, connecting rods, crankshafts, trunnions, etc., in any quantity — we can produce them as soon as forging steel is available.

Cognizant of the shortage of drop hammer facility, Kropp flat die hammersmiths have developed thousands of special tools, dies and fixtures that are used in *making drop forgings on flat die hammers*. No quantity, close tolerance or production speed is sacrificed by this special technique, and a wide variety of parts can be so forged at costs comparable to drop forging.

Hundreds of manufacturers have been helped by this unique Kropp service that avoids the cost of and time for making dies and the waiting for hammer capacity.

Send us your blueprints for estimates, delivery promise and steel schedules.

KROPP FORGE COMPANY

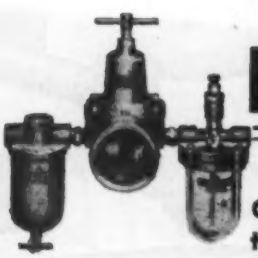
World's Largest Job Forging Shop
5301 W. Roosevelt Road
Chicago (50), Illinois
Representatives in Principal Cities

Don't LAY DOWN ON THE JOB *Now!*

Every air tool in your plant will deliver TOP PERFORMANCE when the Norgren Lubro-Control Unit is on the air line that serves it.

This unit *filters* the air . . . *controls* pressures . . . *lubricates* every working part of the air tool. Injects exactly the right amount of oil into the air stream to create a lubricating fog.

Automatic. Starts and stops with the tool. Ends bucking and balking. Installed direct into any air line. A size and type for every need. Write C. A. Norgren Company, Denver 9, Colorado.



NORGREN *Lubro-Control* UNIT

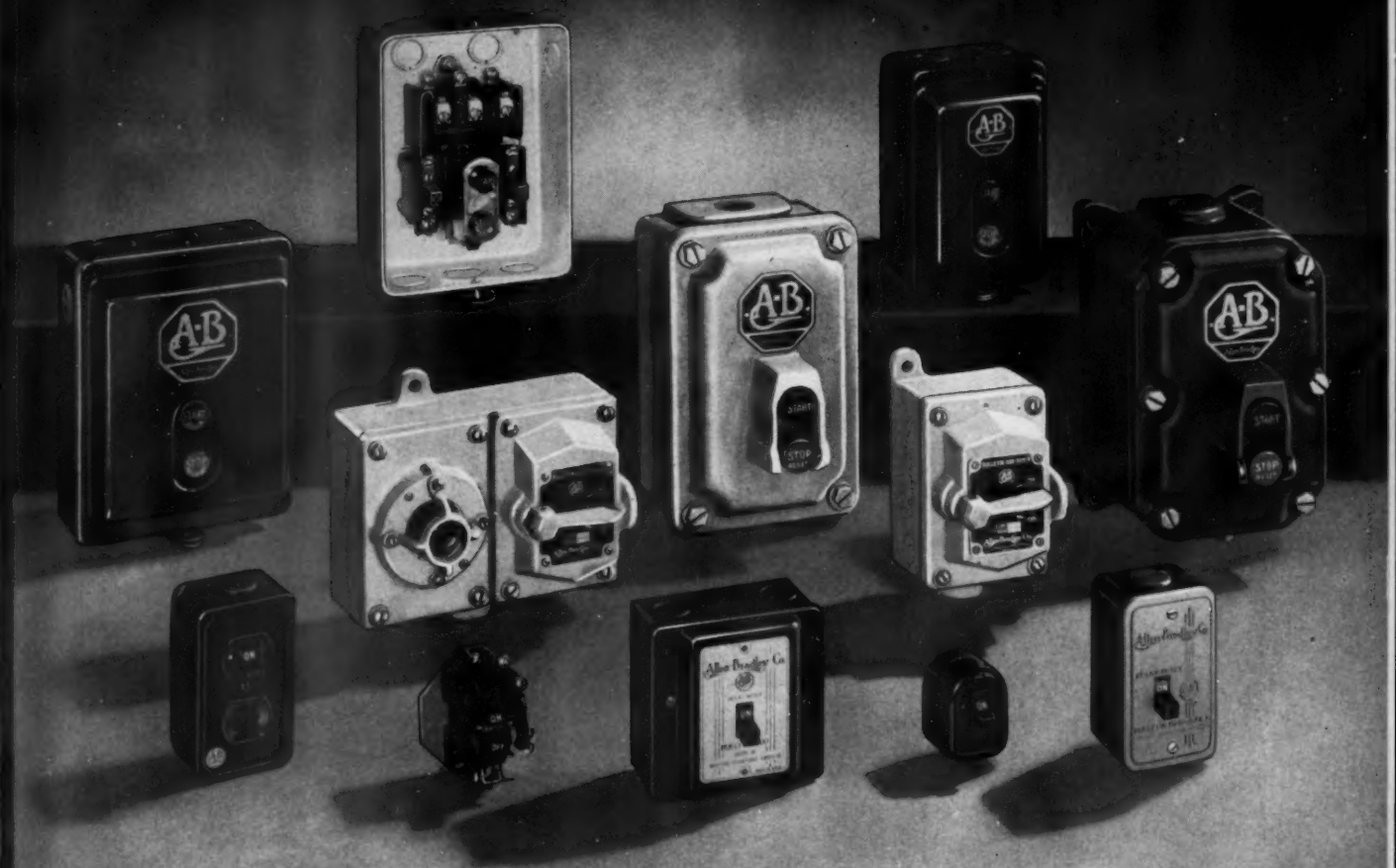
Over 125,000 in daily use thruout industry!

Norgren

MANUAL STARTERS

FOR ALTERNATING CURRENT MOTORS

CONTACTS OPEN AND CLOSE WITH POSITIVE SNAP ACTION



The range of types and sizes . . . and the variety of enclosures . . . make the Allen-Bradley line of manual starters so versatile that you can always find a standard starter to fit any class of service. The reliability of A-B manual starters is due to the design of the switch which prevents "teasing" of contacts.

ALLEN-BRADLEY

MANUAL MOTOR CONTROL

QUALITY

Believe it or not...

You must never clean, file, or dress the contacts of Allen-Bradley solenoid starters . . .

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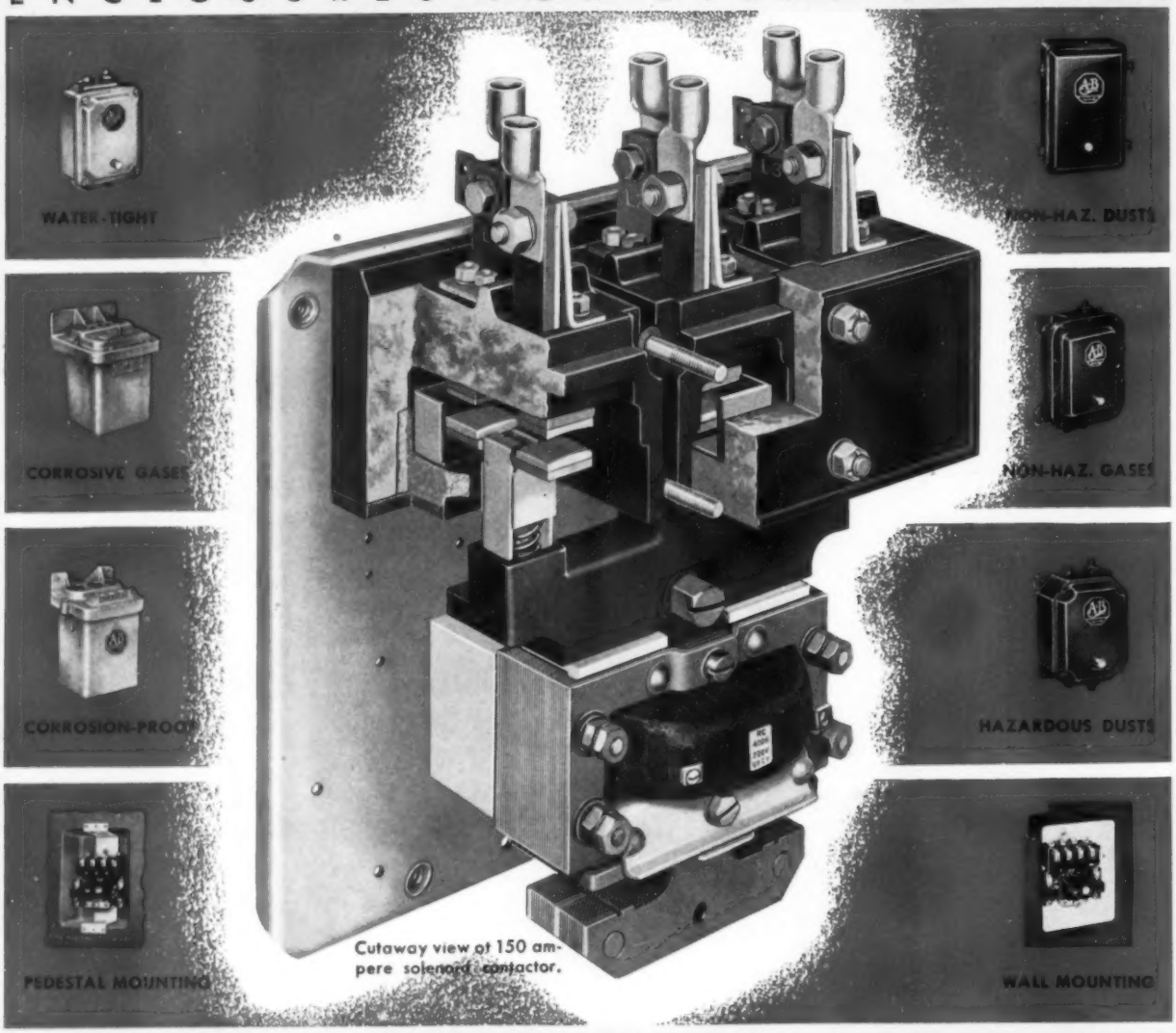

NO TROUBLE WITH CONTACTS

A-B patented silver alloy contacts are good for millions of operations without attention. Just install A-B starters . . . and forget them.

NO TROUBLE WITH STICKING PARTS

A-B solenoid starters have no pins, pivots, or bearings to corrode and stick . . . no flexible jumpers to break . . . no maintenance required.

NO TROUBLE WITH OVERLOADS

A-B overload relays are accurate and dependable. Long periods of idleness do not alter their performance. Specify A-B . . . and be safe.

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A-B Solenoid Starters made in 5 sizes up to 50 hp, 220 v . . . 100 hp, 440-550-600 v.

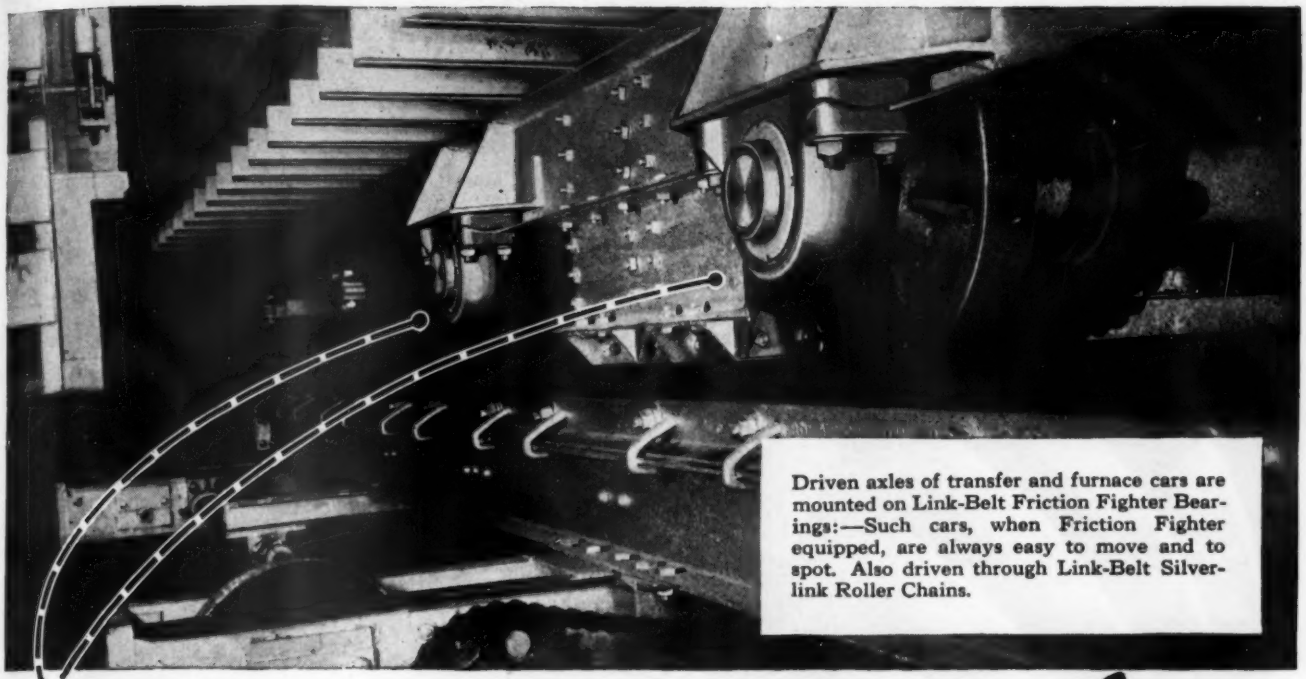
A-B

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

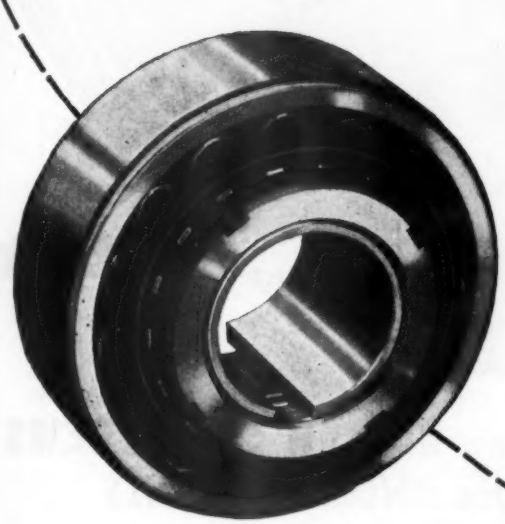
JULY



Driven axles of transfer and furnace cars are mounted on Link-Belt Friction Fighter Bearings:—Such cars, when Friction Fighter equipped, are always easy to move and to spot. Also driven through Link-Belt Silverlink Roller Chains.

Safe, Easy Rides for Valuable Cargoes

Friction Fighter Bearings are at work in the new heat-treating plant of Texas Electric Steel Castings Co. at Houston—one of the most modern plants of its kind. Here, where so much oil industry equipment is produced, they're fighting and whipping friction, just as these self-aligning, free-rolling, dust-proof bearings are doing in many other industries. They have the ability to cope with extremely heavy loads, such as encountered on the loaded furnace cars shown above, or to support shafts operating at extremely high speeds. They carry radial or thrust loads, or any combination of both, with equal efficiency. They are available without mountings or as pillow blocks in units of the flanged, take-up, cartridge, hanger and duplex types. Send for Book 1775A.



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LINK-BELT COMPANY

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LINK-BELT

FRICTION FIGHTER BEARINGS

Roller and Ball Types

Reg. U. S. Pat. Off.

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Self-Locking **HOLLOW SET SCREWS** *with the KNURLED POINTS*

Where ordinary set screws fail to hold, "Unbrako" Self-Lockers stay put for keeps. Their knurled points dig in when the screws are tightened as usual so vibration can't dislodge them — yet they can be backed out with a wrench and used again and again. Apply this safeguard against breakdowns in your mill — today! "Unbrako" Self-Lockers come in sizes from No. 4 to 1½" diameter; and deliveries are better than average. Write for Catalog giving complete information.

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KNURLING OF SOCKET SCREWS ORIGINATED WITH "UNBRAKO" YEARS AGO

FOR BETTER WORK LOWER COST...

This De Laval "Uni-Matic" Oil Purifier keeps hydraulic oil in clean, usable condition at the Euclid Case Plant Division of Chase Brass & Copper Co., Inc.

...Purify Factory Oils

PURIFICATION of hydraulic oil by means of a DeLaval Centrifugal Oil Purifier accomplishes two important results: (1) Pumps used for maintaining the necessarily high pressures in hydraulic cylinders will last longer and require less attention; (2) Danger of pilot mechanism sticking will be minimized.

De Laval oil purification units similar to that shown above maintain at peak efficiency many other kinds of factory oils by removing dirt, grit, metallic particles and water. Included are cutting oils, test oils, washing oils, honing oils, slushing oils, and many others.

Another centrifugal, the De Laval "Hermetic" Coolant Clarifier, by removing harmful abrasives from grinding coolant, permits grinding to closer limits, prolongs wheel life, and enables finer finishes to be produced.

Write for Bulletin FF, "De Laval Purifiers for Factory Oils," for details on many profitable applications for De Laval machines in metal-working plants. It will be sent on request.

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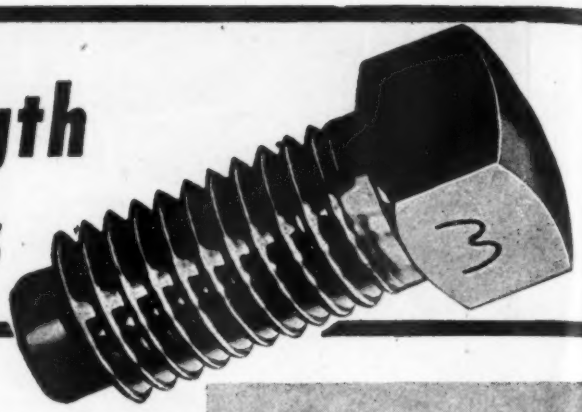
De Laval

PURIFIERS *and* CLARIFIERS *FOR FACTORY OILS*

FOR GREATER OPERATING EFFICIENCY

Added Strength Saves Replacements



These Screws Have a Place in Your Plant

Where tremendous gripping power is necessary and projecting heads present no hazard, there is no substitute for just plain strength. Broken screws, upset points and fatigue failure can be avoided by specifying stronger screws.

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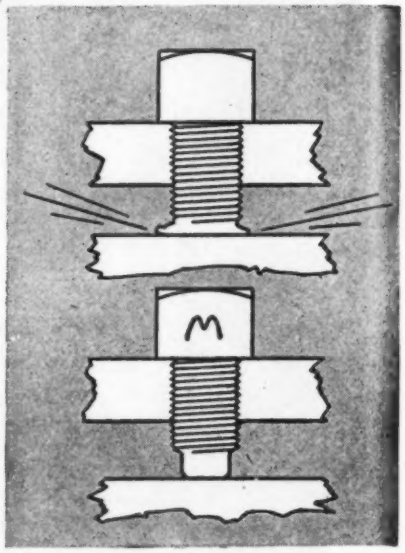
PRONOUNCED "MACK-IT"

Mac-it Square Head Set Screws are heat-treated for maximum torsional strength and to resist upsetting of the points. A ⅝" Mac-it, for example, has a gripping power of more than 25 tons!



OTHER MAC-IT PRODUCTS INCLUDE:
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PRECISION pins for accurate locating of work; for retention of tool and die assemblies under severest stresses. Ground to a limit of .0002" over basic size, with an allowable tolerance of plus or minus .0001".

Metallurgically in the class of ALLEN Hollow Screws: — made of the same special-analysis ALLENOY steel and heat-treated with the same scientific controls. The outer surface is extremely hard with a core of sufficient hardness to resist any tendency to "mushroom" when driven into a tight hole.

Ask your local Industrial Distributor for samples and dimensional data,— the same Allen Distributor who serves your interests with the most dependable supply-items in all lines.

THE ALLEN MFG. COMPANY
Hartford, 1, Connecticut

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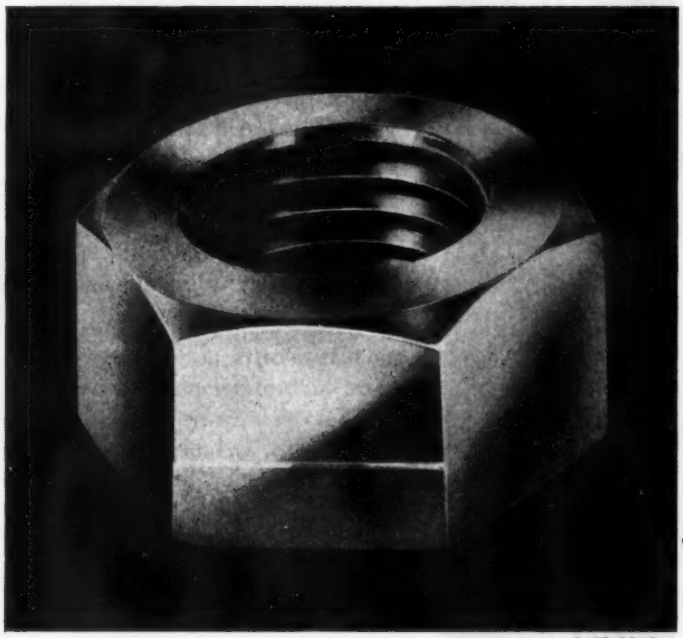
THE STOVER SELF-LOCKING NUT can "take it"!

When you have tested this *new-principle* self-locking nut, you will understand the true meaning of vibration resistance. You will see a precision-made nut which has been transformed into a powerful, metal spring. You will see the natural elasticity of metal employed to provide a mighty *grip* that defies vibration.

And yet the STOVER Self-locking Nut is a simple thing. It is in one piece with no complicated assembly. It does the whole job by itself. It locks at any point desired on the bolt and does no harm to the bolt threads. It can be used over and over without substantial loss of efficiency. It is made in standard sizes and threads from ¼ inch to 1½ inches. Finally, it costs no more than older-type less efficient lock nuts.

Send for descriptive literature and samples.

STOVER
"IT WON'T SHAKE LOOSE"



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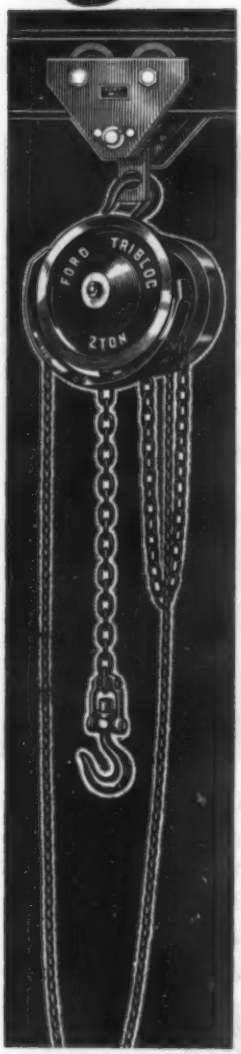
MEETS ARMY AND NAVY SPECIFICATIONS

The STOVER Self-locking Nut is eliminating the loosening effect of vibration on many machines of war. Study it in relation to your postwar planning.

PEACE WILL DEMAND *FAST DELIVERY!*



There will be no armistice for plant production. We are all hurrying to win the war—but we will all have to hurry to win the peace. Plant production will be as important tomorrow as today.

When fast delivery counts—**FORD TRIBLOCS** are ideal for constant hard usage. Spur gear construction, ball-bearing load wheels, both high tensile strength and elasticity in load chain, and many other features assure enduring efficiency. Capacities: ¼ to 40 tons.

FORD SCREW HOISTS are used where **TRIBLOC** high speed and efficiency are not so greatly needed. Light weight; highly portable. Capacities ½ to 10 tons.

FORD DIFFERENTIAL HOISTS are constructed for light service where speed, portability and price count. Capacities ¼ to 2 tons.

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THE JOHNSON FRICTION CLUTCH

QUICK DISENGAGING ASSURED BY THE NEW "MAXITORQ" .. MULTIPLE FLOATING DISC CLUTCH

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This recent Carlyle Johnson development features floating discs, manual assembly, simple adjustment and smooth, easily controlled engagement.
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"MAXITORQ" Clutches represent a distinct advance in this type of mechanism and are applicable for all types of power transmission where smooth operation and quick action are required. Made in capacities from ½ HP to 5 HP at 100 R.P.M., in single, double and cut-off coupling types.

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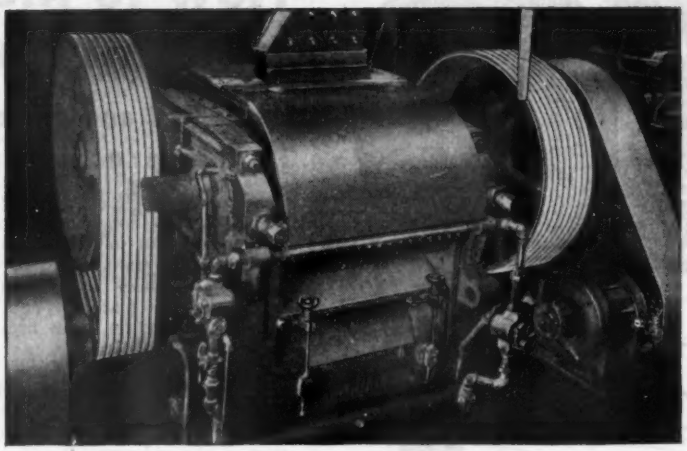

*
One TYPICAL EXAMPLE

On these flaking rolls where gas flames create considerable heat, Gates V-belts of special synthetic rubber are used because of their proved ability to withstand bad heat and oil conditions. By actual records, on hundreds of installations where oil or heat conditions are severe, Gates special synthetic V-Belts are wearing 2 times to 3 times as long as any natural rubber belts ever used.

Through More Than **6 YEARS** *in Hundreds of Plants* *

GATES *Synthetic Rubber* V-Belts

—Have Been OUTWEARING Any NATURAL Rubber Belts Ever Used!

Now that all industry depends on belts made of synthetic rubber, it is well worth-while to know that Gates Synthetic Rubber V-Belts have been in nation-wide use for more than 6 years—and *through all that time* they have been giving service actually *superior* to belts of *natural rubber!*

*There are, of course, many kinds of synthetic rubber. Gates uses each kind where it best meets some particular service need.

For example:—one special synthetic rubber which Gates uses extensively in making V-Belts has the ability to withstand oil and heat much better than natural rubber can. Where oil and heat conditions are especially severe, Gates special synthetic V-Belts are giving *3 times* to *4 times* the service life of *any natural rubber* V-Belts ever used.

This is the record not of a few belts over a limited period but of thousands upon thousands of Gates synthetic rubber V-Belts installed in hundreds of plants and factories during the past 6 years.

Gates long headstart in fabricating V-Belts of synthetic rubber is of greater importance to you now than ever before because *all* the V-Belts furnished industrial plants today are of *synthetic rubber.*

You will gain a distinct advantage in V-Belt service by simply picking up your telephone directory and calling the Gates Field Engineer. He will bring right into your plant the full benefits of Gates knowledge and experience without the slightest obligation.

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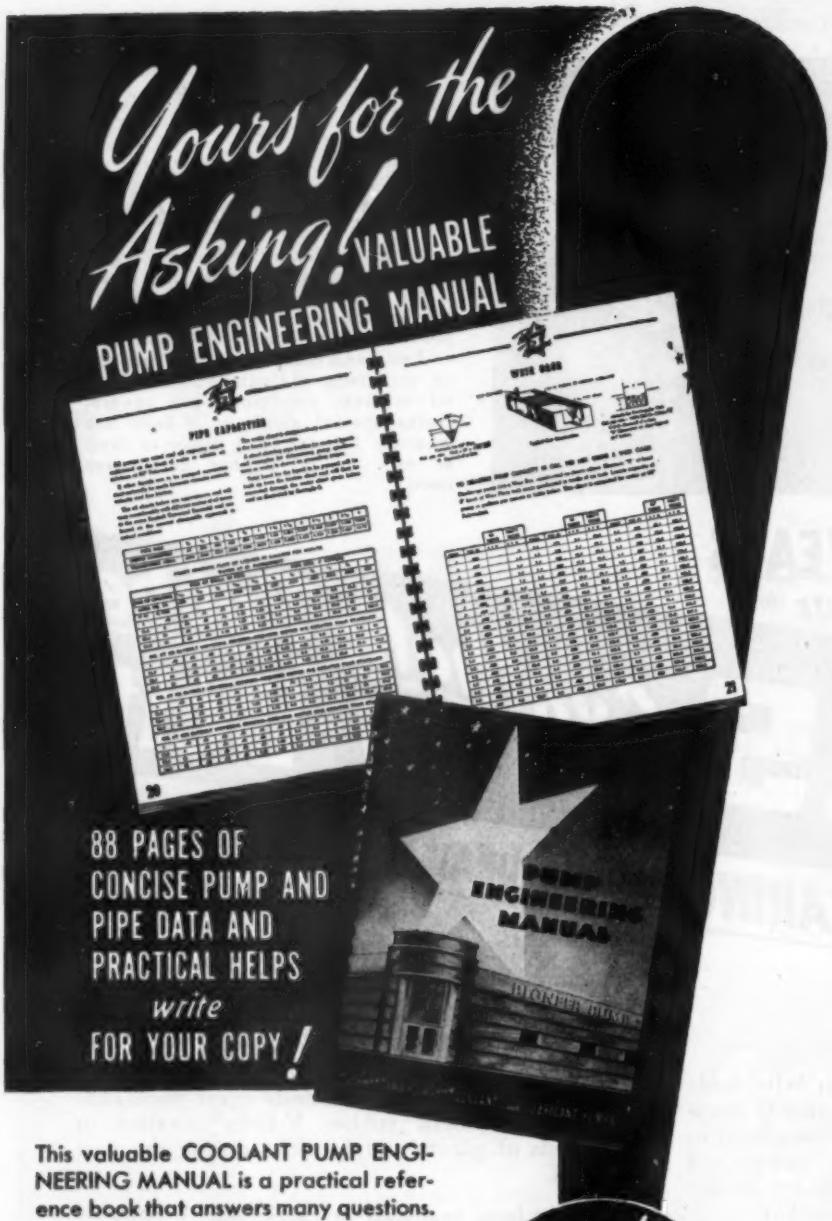
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described and demonstrated in this practical manual

Here at last is a course in time study for those who do not have extended technical, mathematical, or industrial training. It starts at the very beginning and covers completely both the methods of time study and the background of machines and operations of industry the time study man must understand, in a practical, home-study treatment. The author of the book says, "Anyone who can rate 90% in answering these questions (appearing at the end of each chapter) would be able to take and hold a time study position in any industry."

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President, Detroit Time Study School, Inc.

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The book shows the whys and wherefores of time study work, reviews the arithmetic needed, tells step by step how to carry out a time study and gives a wealth of information on the machines and processes of industry, what the time study man should know about their construction and operation, and the special factors of taking time studies on each. Twenty-eight specimen studies on specific machines and operations are shown and fully discussed in the text.

- **gives 26 time-study charts; each from an actual observation in industry.**
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Covers: Fundamentals of time study, requirements of work, equipment and how it is used, etc.; the basic motions and how they are used in analyzing operations; how to read the stop watch; how to study an operation and record the figures; how to rate the operator's efficiency; how to figure group bonus and standard hours; how to make process or flow charts, etc.

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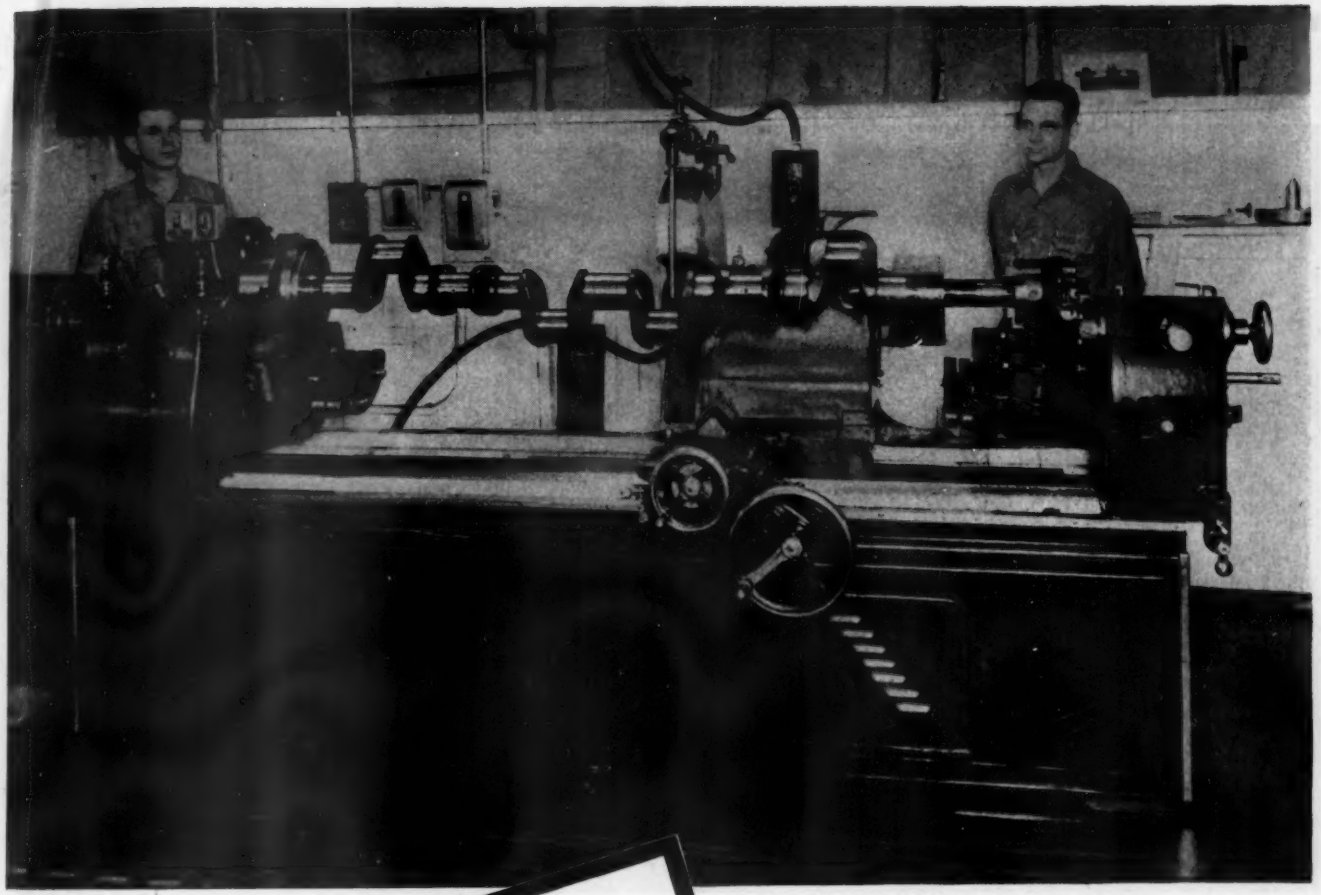

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SKF

BALL AND ROLLER BEARINGS

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That's why this Lempco Crankshaft Grinder has an SKF-equipped spindle.

Not only do SKF Bearings maintain spindle rigidity, but combine a silklike finish and an excellent spark-out with smooth operation at low temperature.

An SKF-equipped grinder is always a grinder that's well-engineered for precision work. 5599

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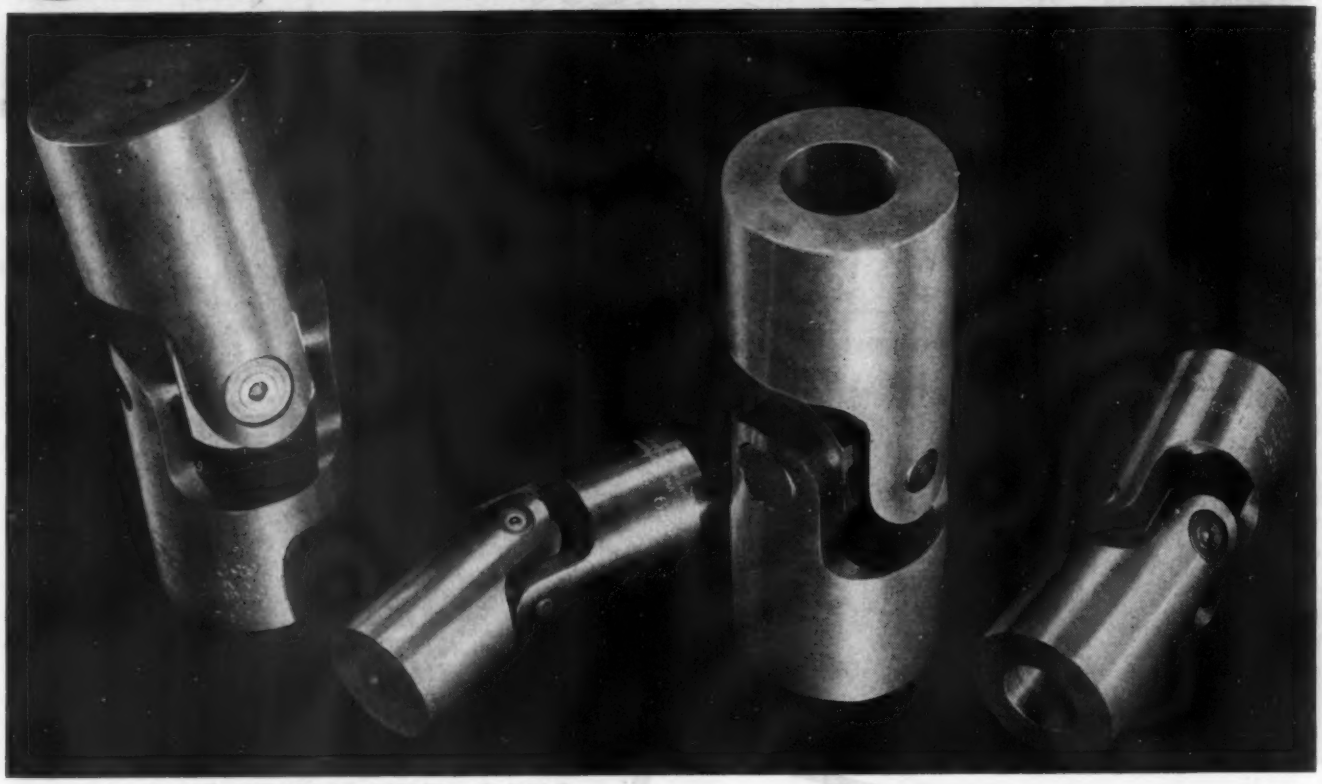
UNIVERSAL JOINTS



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BOSTON GEARS

Philadelphia

AIRKOOLED

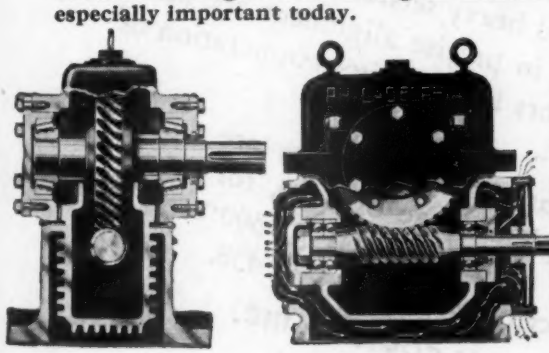
Worm Gear Speed Reducer

MORE LOAD CAPACITY
MORE COMPACT
Less Weight • Less Space

The New Philadelphia AirKooled Worm Gear Speed Reducer offers considerably greater horsepower ratings than the standard heavy duty type unit for worm speeds of 580 to 1750 RPM. At 1750 RPM, the ratings are approximately doubled at all ratios.

Horsepower ratings of standard worm gear units at higher worm speeds are limited due to the rise in temperature of the oil bath. The AirKooled unit dissipates this heat by drawing cooling air through the double walled ribbed housing with a suction fan mounted on the worm shaft.

At 1750 RPM, where the rating advantage is greatest, the AirKooled unit will be about two sizes smaller than a standard unit of the same capacity, resulting in a great saving in space and approximately a 40 percent reduction in weight. This saving in critical materials is especially important today.



Sectional Views showing double walled construction, direction of air circulation and fan mounted on worm shaft.

Send for Bulletin 250 . . . on your Business Letterhead

Philadelphia GEAR WORKS INCORPORATED

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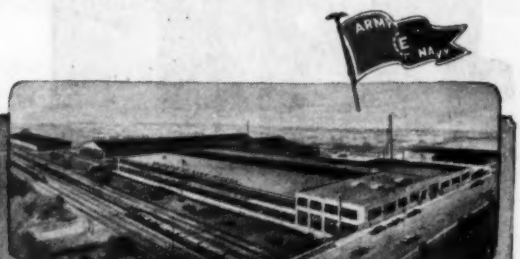

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

WHY IS QUIET OPERATION SO IMPORTANT IN A SPEED REDUCER?

In some installations a little noise from a speed reducer would not be noticed, and a loud clatter would only add to the general din. So why talk about quiet operation?

Simply because there is no *normal reason* why a speed reducer of modern design *should* be noisy. Take a Farrel Class "R" unit for example.

The gears used are of the continuous tooth design which means that a maximum number of teeth are always in mesh. Overlap or interlacing of teeth, together with gradual engagement, are characteristics which promote smooth, quiet operation. Then too, oblique lines of contact and evenly distributed pressure eliminate danger of noise resulting at some later date from uneven tooth wear.

High precision gear generation, rigid and accurately machined shafts properly mounted in roller bearings, and heavy section cases that hold rotating elements in precise alignment are also contributing factors in the noiseless operation of Farrel gear units.

These "silent partners" of industry are available in a complete range of sizes, for any capacity, with ratios from 1:1 to 300:1. Write for descriptive catalog No. 438.

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Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
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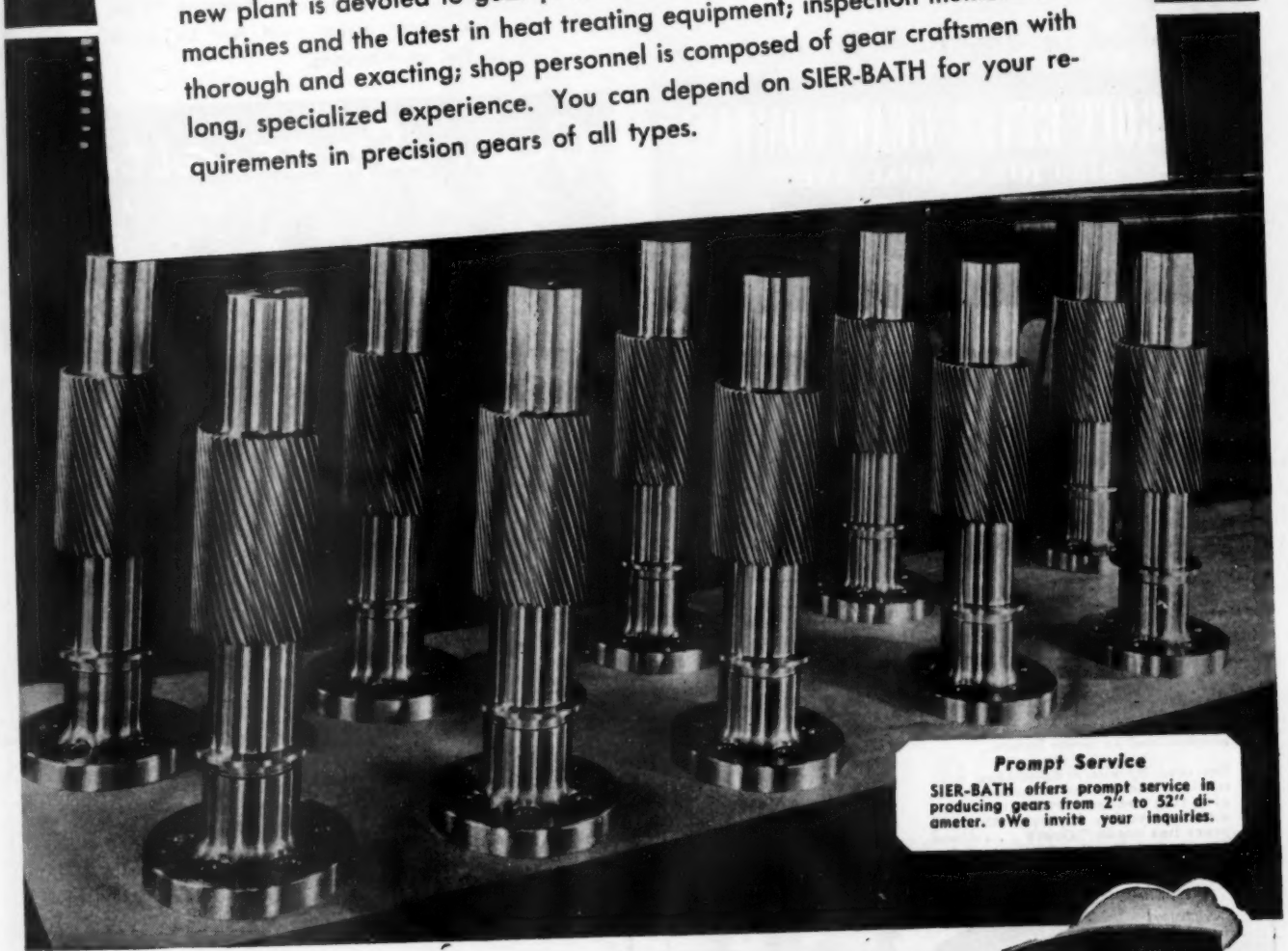
FARREL
The Gear with the Cast Backbone

Farrel-Birmingham

PRECISION GEARS

TO YOUR SPECIFICATIONS
can be produced promptly by
SIER-BATH

The gears shown here are a few recently produced by SIER-BATH on a large order. The specifications covering these gears called for extremely close tolerances. SIER-BATH is particularly well equipped to handle precision gear work. Our new plant is devoted to gear production exclusively with the most modern machines and the latest in heat treating equipment; inspection methods are thorough and exacting; shop personnel is composed of gear craftsmen with long, specialized experience. You can depend on SIER-BATH for your requirements in precision gears of all types.



Prompt Service

SIER-BATH offers prompt service in producing gears from 2" to 52" diameter. We invite your inquiries.

SIER-BATH GEAR CO.

9254 HUDSON BOULEVARD NORTH BERGEN, N. J.

Incorporated

The Doorway to 38 years experience in making Precision Gears

PRECISION GEARS

AS SMALL AS 5/16" ARE BEING PRODUCED BY DETROIT BEVEL GEAR

★

Gears of all types are manufactured exactly to your specifications in sizes up to 16".

Supplied in any desired Material

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Makers of Quality Gears for 30 Years

Gear Specialties

SPURS • HELICALS • BEVELS
(Straight & Spiral)
WORM GEARING • THREAD GRINDING
(14 to 96 D. P.)

This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

With full production capacity scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every urgent need will be given careful consideration.

Gear Specialties
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CHICAGO

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Dependable Performance
always with
Cincinnati Gears

The traditional dependability of Cincinnati Gears under the toughest of operating conditions is being emphasized as never before.

Bettered by every advantage that modern science and techniques can give, they are representative of that standard which for more than 40 years has made *"Gears . . . Good Gears Only"*, the choice of industry.

THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
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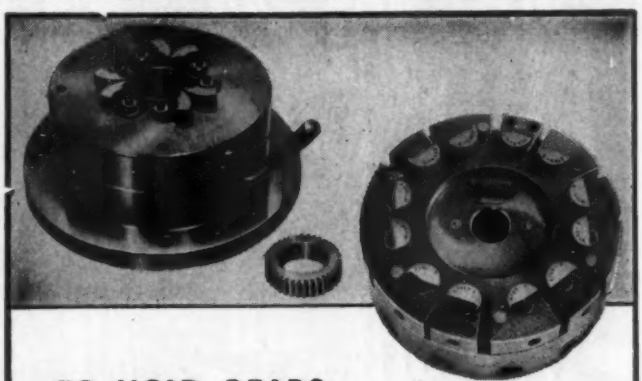

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with precision for boring or grinding
HAVE TEETH GRIPPED ON LINE OF ACTION
Principle used only in

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Method eliminates distortion. Gears have perfect, round holes. Made for internal and external gears, for spur and helical gears, and for countershaft type gears.

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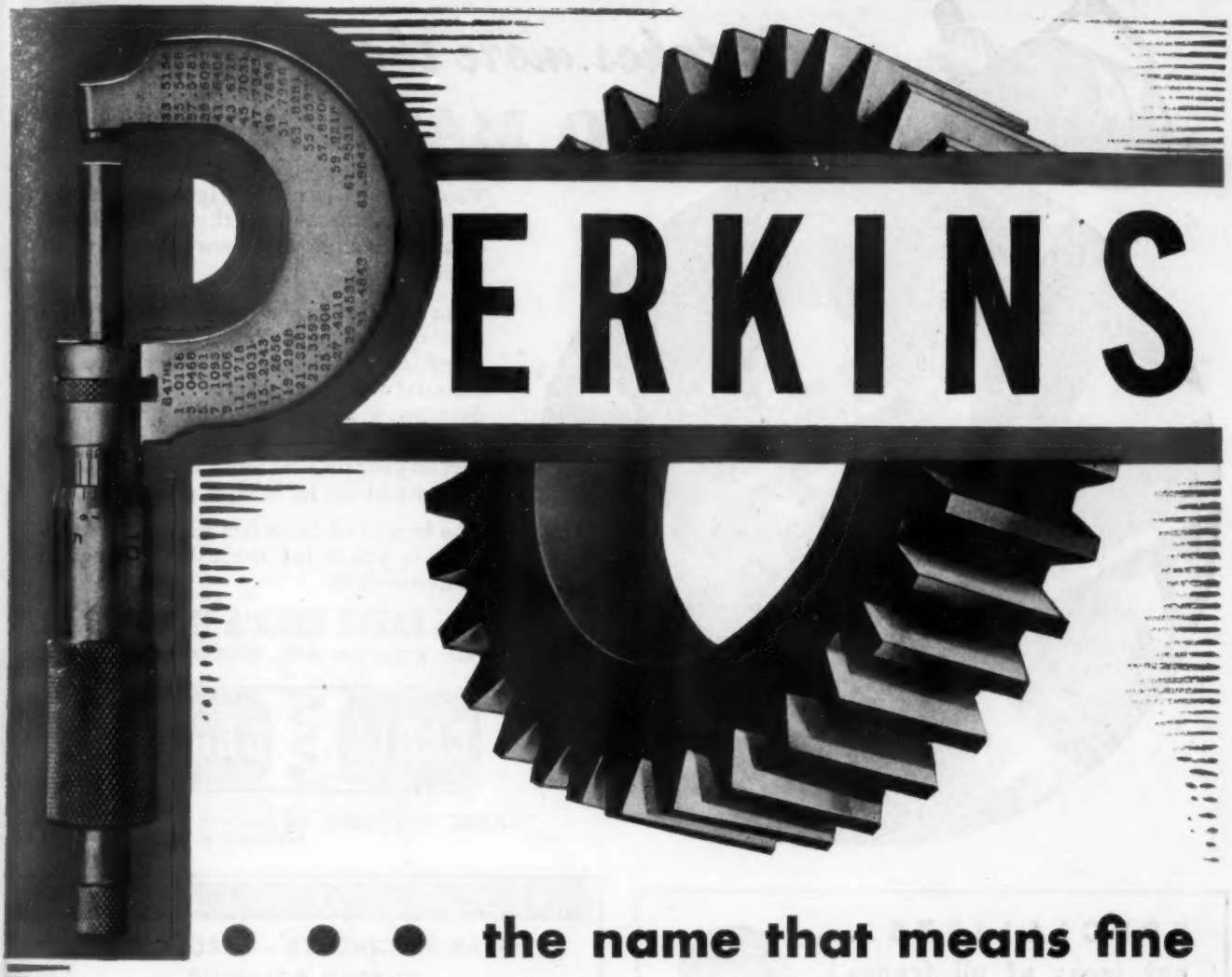

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● ● ● the name that means fine craftsmanship in the design and production of precision, custom-cut gears to the most exacting specifications ● consult Perkins now on your gear engineering problems ●

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Helical Gears *Bevel Gears* *Ratchets*
Worm Gears *Spiral Gears* *Spur Gears*
Ground Thread Worms

PERKINS PRECISION, CUSTOM-CUT GEARS

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TO MAKE A GEAR

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ALL TYPES, MATERIALS
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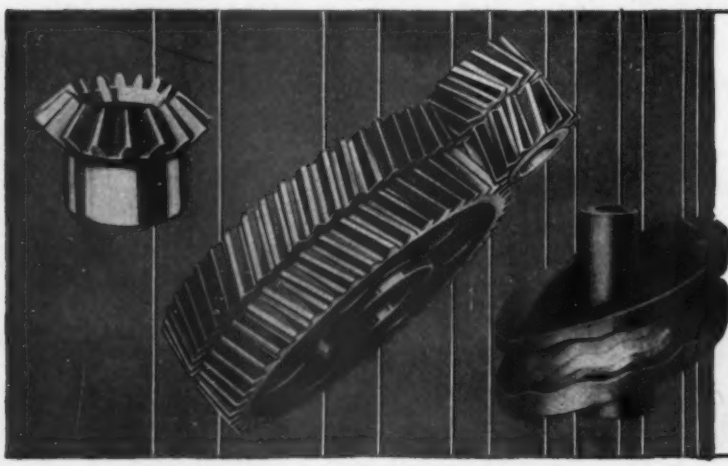

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And in the Pratt & Whitney engines that drive this most powerful of all pursuit planes are Foote Bros. Gears—gears that of necessity meet new standards in metallurgical and dimensional perfection.

The Black Widow forecasts a new conception of design for the world of tomorrow—an era where high speed, the demand for greater efficiency, will find new uses for high precision gears. The engineering skill, production technique, manufacturing know-hows that have made possible the mass production of gears of such high precision may suggest applications in the development of machines you are designing for a world at peace.

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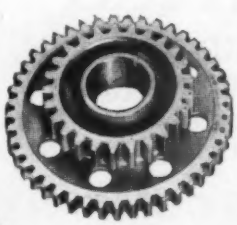

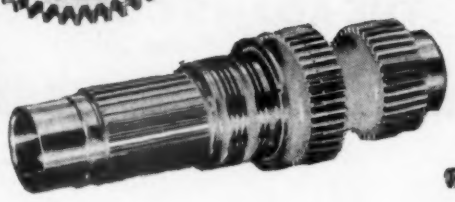

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You will find GRANT service meeting all requirements of both stock and special gears."

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Stahl gears will measure up to every requirement you demand—in material, accuracy, workmanship and performance. In price, too, you'll find Stahl assures satisfaction because we're "geared" to produce gears to any specifications in any quantity, economically. So outline your requirements and let us quote. You can depend on Stahl for a prompt estimate and fast service.

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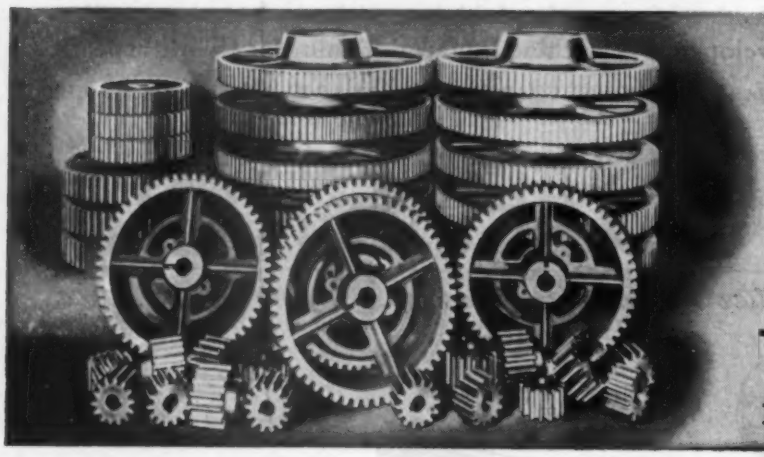

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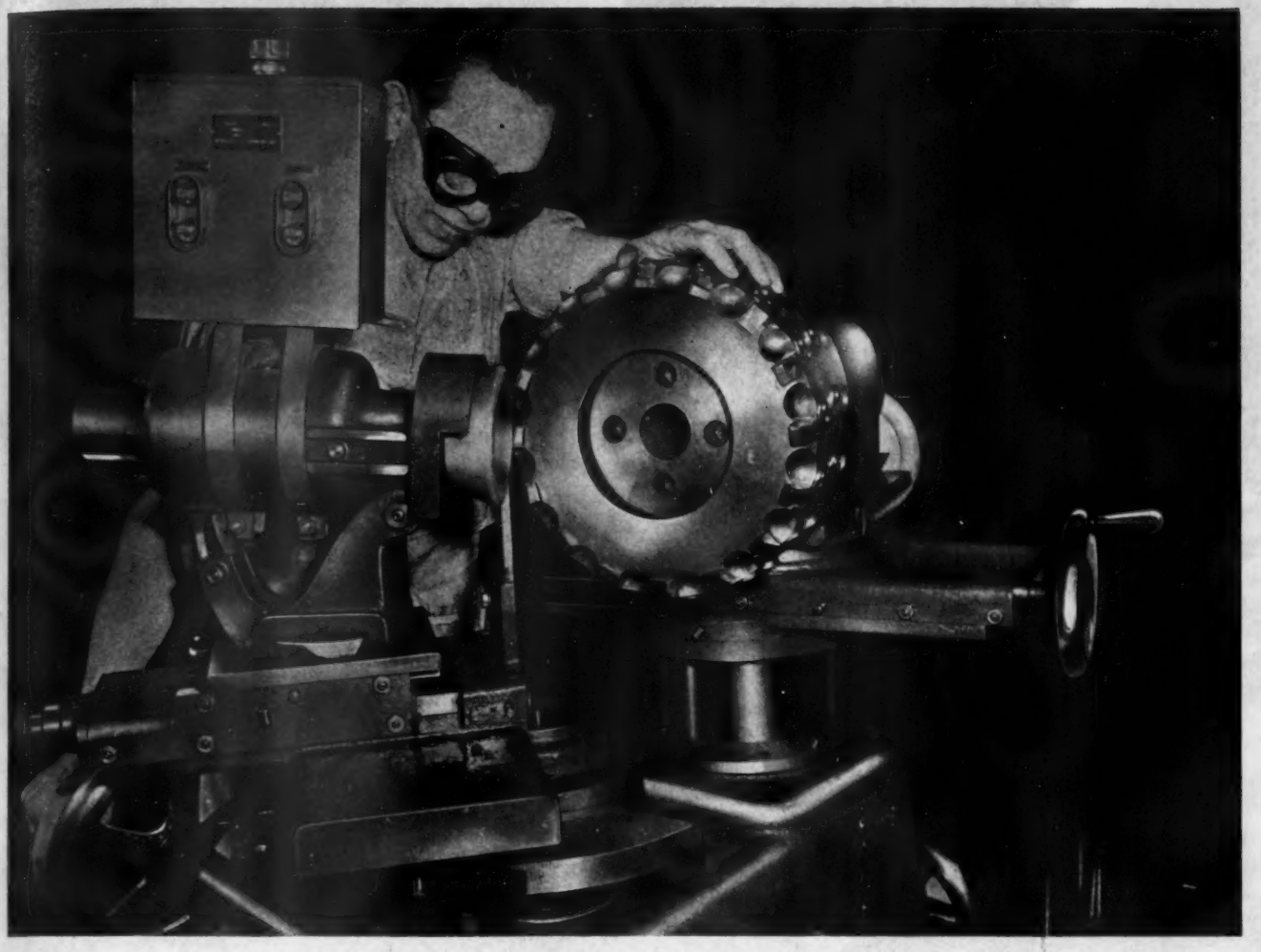

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Don't Neglect Your Toolroom It's the Backbone of Production!

The increasing use of negative rake milling cutters is helping the nation's leading aircraft producers step up their output to meet the call for "More planes!" Photo above, taken in a plant of the Boeing Aircraft Company, shows a tungsten carbide tipped cutter for negative rake milling being ground on an Oliver Arc Face Mill Grinder. The Oliver Arc Face Mill Grinder sharpens these modern high-speed tools correctly, in faster time — and assures top-grade operating efficiency for the latest metal-cutting practices. Use Oliver Face Mill Grinders to keep all your cutters properly ground for faster production improved work, maximum tool economy. Write today for literature! OLIVER INSTRUMENT COMPANY, 1414 E. Maumee St., Adrian, Michigan.

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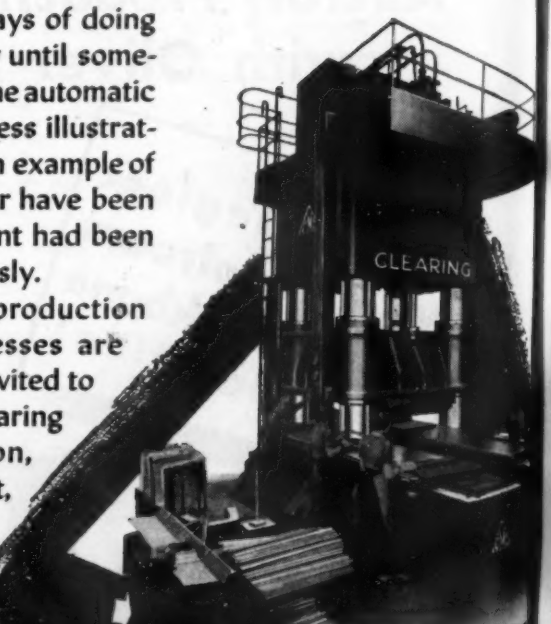
For solution to production problems where presses are concerned, you are invited to call on Clearing. Clearing Machine Corporation, 6499 West 65th Street, Chicago 38, Illinois.



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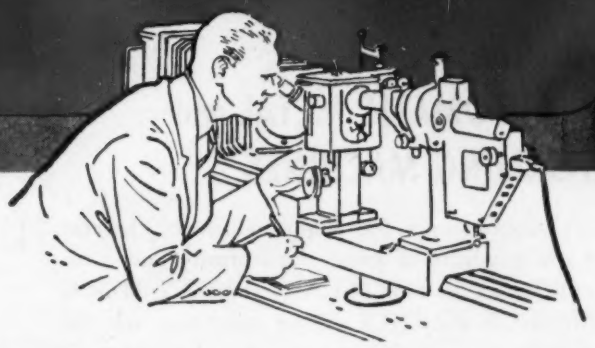

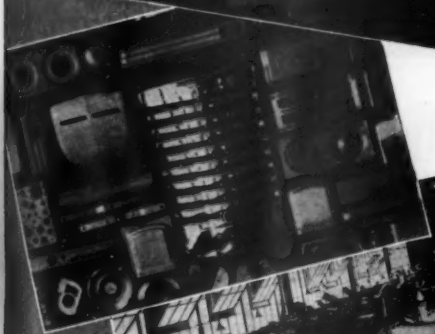

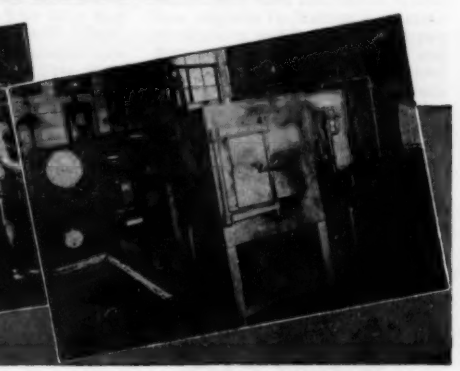

THE Advance Die and Tool Company . . . committed to the building of best Sheet Metal Stamping Dies . . . determined to acquire *exact knowledge* of die making steels and alloys.

An extensive series of laboratory tests were conducted to scientifically determine those die making materials which—

Provide Longest Tool Life
Eliminate "Galling" or "Pick-Up"

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The operation required punches of great strength, freedom from galling and resistance to abrasion. Advance punches consistently produced 300% to 400% more cases than any other punches tried.

Advance Die and Tool Company are using its design and manufacturing facilities in the war effort for the duration . . . but, when peace comes, plan to use Advance *exact knowledge* in building your sheet metal stamping tools and dies.

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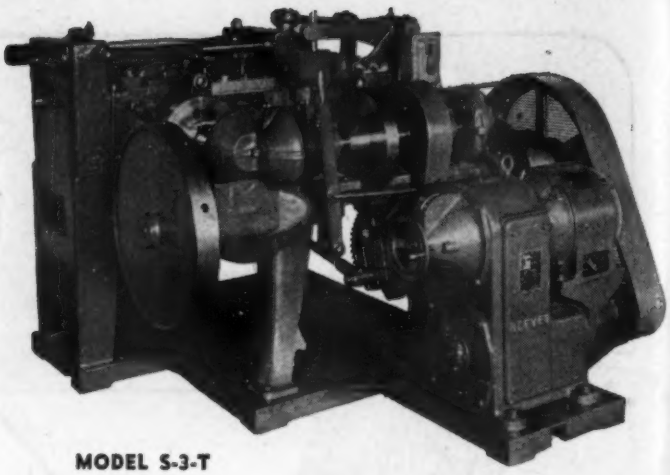
STEP UP PRODUCTION OF FORMED PARTS

. . . with the

NILSON AUTOMATIC METAL and WIRE FORMING MACHINES

Today's requirements for higher efficiency, greater speed and products of greater uniformity and accuracy are met in the new NILSON RIBBON STOCK FORMING MACHINES. These machines are the achievement of over fifty years accumulated experience in designing and building metal forming machines. Careful selection of materials and skilled workmanship result in machines that are famous for long life and low maintenance.



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FEATURES THAT CONTRIBUTE TO BETTER, FASTER WORK

Superior features of the NILSON four-slide forming machines are the result of long experience and include:

. . . open construction of press and forming tools.
. . . patented slide feed which has an independent cam-operated wire gripping device.
. . . transmission of power operating wire feed through a straight line.

Send for 4-page circular giving further information as well as detailed specifications of sizes and capacities.

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We have been engaged in the design and production of special automatic machinery of high production capacity for over thirty years. We are prepared to render a complete service in connection with the design and production of automatic machinery of every description. Consult Nilson on your requirements.

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Simple Solutions OF PRESSING PROBLEMS

Famco Arbor and Foot Presses can simplify a myriad of pressing and punching jobs. • They are low in first cost. • Low in upkeep cost (practically no attention or cost is needed for operation) • Easy to operate (girls can operate all types with ease) • Simple to set up. • Occupy small floor space. There's a model and style of FAMCO ARBOR and FOOT PRESS for every light pressing or punching job. FAMCO engineers will help you select the right press for your problem from over 40 stock sizes. Write for details without obligation.

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the Demand for

HOVIS UNIVERSAL MASTER WASHER DIES

Keeps Spreading!

THROW a stone into the water . . . What happens? The ripples keep spreading endlessly . . . It's the same with the modern HOVIS METHOD OF MAKING WASHERS. More and more of America's leading manufacturers in the aircraft, electrical and radio fields are adopting it . . . The acceptance is big . . . and growing! No wonder when it is no longer necessary to make a new die for each size and type of washer. Simply invest in HOVIS MASTER DIES inexpensively to fit your needs, and then 5 SMALL REMOVABLE, INTERCHANGEABLE PARTS are all that it is necessary to buy in order to make any size washer. No process engineering, tool designing, tool making or tool tryout.

When planning your postwar products, remember that a number of Hovis Master Washer Dies have been in continuous use for more than 4 years, and the Master Dies themselves do not become obsolete. A new set of interchangeable parts are all that you need for your new products.

Made in Four Sizes: ¾" — 1½" — 2½" — 4".

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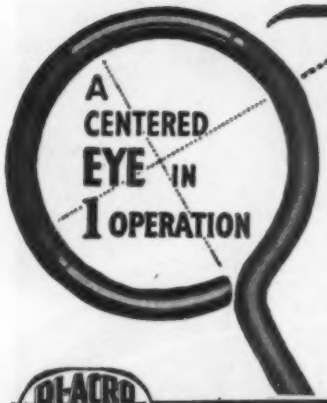

Precision CENTERED EYE Bending

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at high hourly production rates. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

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Forming radius 2" approx. Capacity ¼" round cold rolled steel bar or equivalent. Also Benders No. 2 and 3, with larger capacities.

With DI-ACRO Benders

DI-ACRO Precision Bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

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DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

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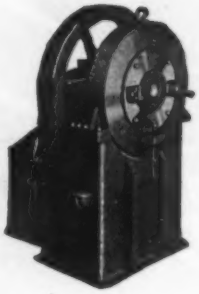

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TORRINGTON
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— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

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"Ask ETNA about Swaging"

• If you have a production phase that calls for tapering, sizing or reducing of solids or tubes, you can save money if you "ASK ETNA ABOUT SWAGING." The superior performance of ETNA machines assures you more pieces per hour at lower cost. Built in capacities of ⅛" to 4" . . . larger sizes built to order!

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Send for No. 9 Catalog giving complete specifications.

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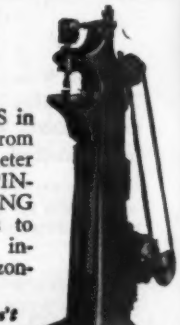

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Write for literature and don't forget to send samples.

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SAFETY "WEDGE GRIP" STEEL HAND STAMPS

Ideal for mass production markings of defense products . . . trade marks and symbols. Any size or number of characters available.

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SAFETY STEEL STAMPS
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MASONITE* DIE STOCK-

Masonite Die Stock used in a stretch press to form aluminum strips at Fairchild Aircraft, Division of Fairchild Engine & Airplane Corporation.

MASONITE Die Stock is being used more and more for forms on stretching machines.

This is one of the ways in which this modern die stock is being employed by aircraft manufacturers throughout the country. It's a great time and money saver when used for special types of mating dies, forming blocks, templates, jigs and fixtures.

Remember, while Masonite Die Stock is only one-sixth the weight of steel, it has great compressive and flexural strength. It can be fabricated in pattern or metal shops with great speed, and it stands up under present-day production requirements.

Masonite Die Stock is available in thicknesses of ¼ to 2 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. If you want to know more about this amazing semi-plastic material, which is so easy to handle and will not shrink, check or twist, please mail the coupon.

*TRADE-MARK REG. U. S. PAT. OFF. COPYRIGHT 1944, MASONITE CORPORATION

Awarded to the Masonite Corp. plant at Laurel, Miss.

MASONITE CORPORATION *Dept. AM-7, 111 W. Washington St., Chicago 2, Illinois*

Please send me illustrative literature and complete information about Masonite Die Stock.

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*Address*_____

*City*_____ *State*_____

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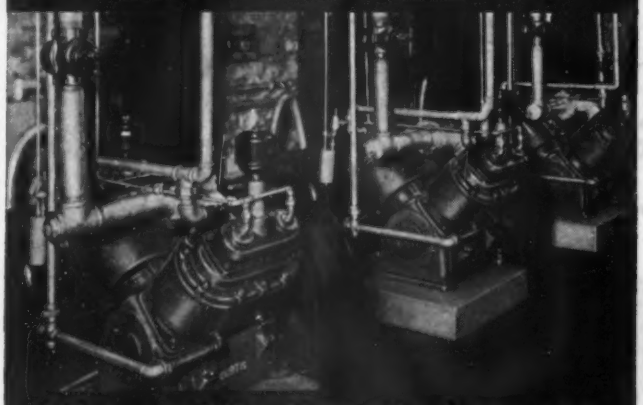

5 Years of 24-Hour Performance
At Carter Carburetor Corporation

☆ Installed in 1936 at the St. Louis Plant of Carter Carburetor Corporation, the three Curtis Air Compressors shown above were on almost continuous 24-hour duty for five years. During this period, they operated at 80 lb. pressure, providing air for the entire plant.

J. H. Klasey, plant engineer, states that "they gave surprisingly good service with very little maintenance."

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- Centro-ring Lubrication
- Carbon-free Disc Valves
- Automatic Pressure Unloader
- Precision Construction Throughout

Curtis Compressors are available in capacities up to 300 cfm. For proof of their efficiency and operating advantages, send the coupon for full information and free booklet, "How Air Is Being Used in Your Industry."

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City.....State.....

The Difference may be only a few Salt Tablets

. . . and they cost less than 1 cent a man per week

Salt is vital to proper body tone. Loss of salt through sweat can easily transform an eager, alert, comfortable worker into one who is fatigued, miserable, careless.

Loss of salt dehydrates the body, thickens the blood, destroys the equilibrium of body fluids. The results are Heat-Fag, inalertness, accidents, heat prostrations.

The preventive is salt and water — water to restore the moisture lost in sweat, salt to restore the saline balance. Water alone won't do it. Under hot, "sweaty" conditions water alone dilutes the blood and causes heat cramps.

Industrial physicians with America's greatest manufacturing plants have found that the easy, simple, economical way to provide essential salt is Morton's Salt Tablets at every drinking fountain. A tablet with every drink of water is all that's necessary to prevent Heat-Fag, heat cramps, heat prostrations—to keep workers alert, at peak production.

This Is What Happens When Sweating Robs the Body of Salt . . .

QUICK DISSOLVING
(Less than 30 Seconds)

This is how a Morton's Salt Tablet looks when magnified. See how soft and porous it is inside. When swallowed with a drink of water, it dissolves in less than 30 seconds.

Case of 9000, 10-grain salt tablets $2.60
Salt-Dextrose tablets, case of 9000 . . . . . $3.15

MORTON'S Heat-Fag SALT TABLETS

Morton's Dispensers

They deliver salt tablets, one at a time, quickly, cleanly—no waste. Sanitary, easily filled, durable.

800 Tablet size . . . $3.25

Order from your distributor or directly from this advertisement . . . Write for free folder.

MORTON SALT COMPANY, Chicago 4, Illinois

50 YEARS OF PIONEERING MAKES BAUSH DEVELOPMENT OF MULTIPLE DRILLING A VALUABLE AID IN TODAY'S PRODUCTION

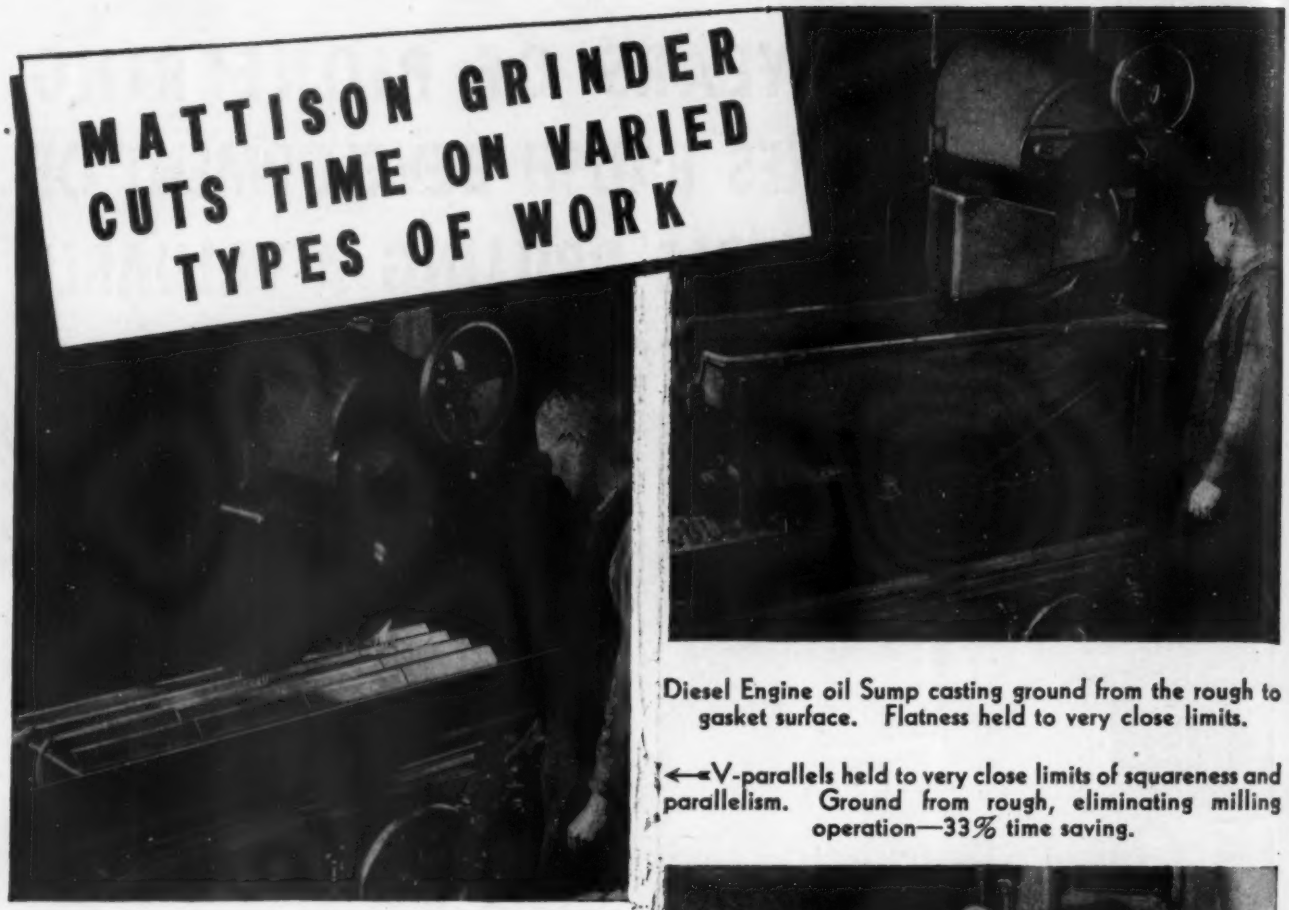
23 Holes drilled quickly, accurately, simultaneously in vital aircraft parts

This W-6 BAUSH HYDRAULIC MULTIPLE SPINDLE DRILLING MACHINE is set up for drilling 11 holes in spacer carburetor adapter and 12 holes in body carburetor back fire relief. All drilling operations on the two parts are performed simultaneously. The machine is equipped with a 16" x 20" head and is furnished with 21 - 1¼" dia. and 2 - 1" dia. spindles. Work is supported on an adjustable knee table.

Baush machines — for Multiple Spindle Drilling, Tapping and Boring — are the result of fifty years specialized experience. They are playing an important role in stepping up today's war production.

BAUSH MACHINE TOOL COMPANY
SPRINGFIELD 7, MASS.
DETROIT 0, MICH.

MATTISON GRINDER CUTS TIME ON VARIED TYPES OF WORK



Diesel Engine oil Sump casting ground from the rough to gasket surface. Flatness held to very close limits.

←V-parallels held to very close limits of squareness and parallelism. Ground from rough, eliminating milling operation—33% time saving.

● A great variety of work can be speedily and easily handled on the Mattison High-Powered Precision Surface Grinder. The massive double column support for the wheel head, high power, smooth rapid double-cylinder hydraulic table drive, large capacity and ruggedness of construction provides repeated precision grinding results on a high production basis.

Shown here are just a few of the many jobs ground to advantage on Mattison Grinders at the plant of E. H. Hasselkus Company, Milwaukee, Wisconsin

Write for the free Set-Up Book, containing further examples, showing how others have reduced time and increased production with Mattison Grinders.

Tool steel bar stock ground from rough. Square and parallel to within close limits.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

(Above) **BARNESDRILL** *No. 30 Horizontal Hydraulically Reciprocated Honing Machine with 76 feet spindle stroke for honing up to 42" diameter. Note hone cradle and the four traveling supports for the driving bar.*

(Right) Interior of 2½" bore in Di-Hard tubing. The circles of light would reveal the inaccuracies or out-of-round condition. Here the natural circles of light are perfect after honing.

● The honing of bores of long cylinders, such as oil well working barrels, gun barrels and other long cylindrical parts, produces a smoothness unobtainable by any other machining method. Barnes Drill Co. has developed a line of horizontal honers capable of operating on workpieces of great length, yet occupying a minimum of floor space and efficiently meeting every essential feature necessary for accurate honing. These horizontal honers are available in several sizes and various lengths according to the class of work to be honed. **BARNESDRILL** machines have been furnished for honing hydraulic cylinders and other large tubing up to 76 feet in length and diameters up to 42".

(Above) **BARNESDRILL** *two spindle No. 6 Horizontal Honing and Straight Line Lapping Machine, with adjustable or elevating duplex cradle. Two hydraulic cylinders are being honed simultaneously while two more are reloaded in spare stations.*

In addition to providing a smooth finish free from damaging scratches, but accurate within very close tolerances, honing provides the fastest, most economical method of finishing long work. A gun tube 5" in diameter, 23 feet long, can be honed with a stock removal of .014" from the diameter per hour. On another 90 mm. tube 13½ feet long, .018" of stock was removed in 1½ hours. It required only 45 minutes to remove .050" of stock from a recuperator cylinder 52" long x 4½" diameter. These are but a few examples of production honing with **BARNESDRILL** Horizontal Honers.

If you have extra long cylinder bores to finish, consult **BARNESDRILL** engineers for their recommendations as to the proper honing machine for your work. There is no obligation for this service.

Additional Data

For more complete details and specifications on **BARNESDRILL** Horizontal and Vertical Honing Machines, write for free copy of Bulletin No. A-135.

Barnes Drill Co.

830 CHESTNUT STREET
ROCKFORD
ILLINOIS, U. S. A.

L-W

High Speed

POWER HACK SAWS

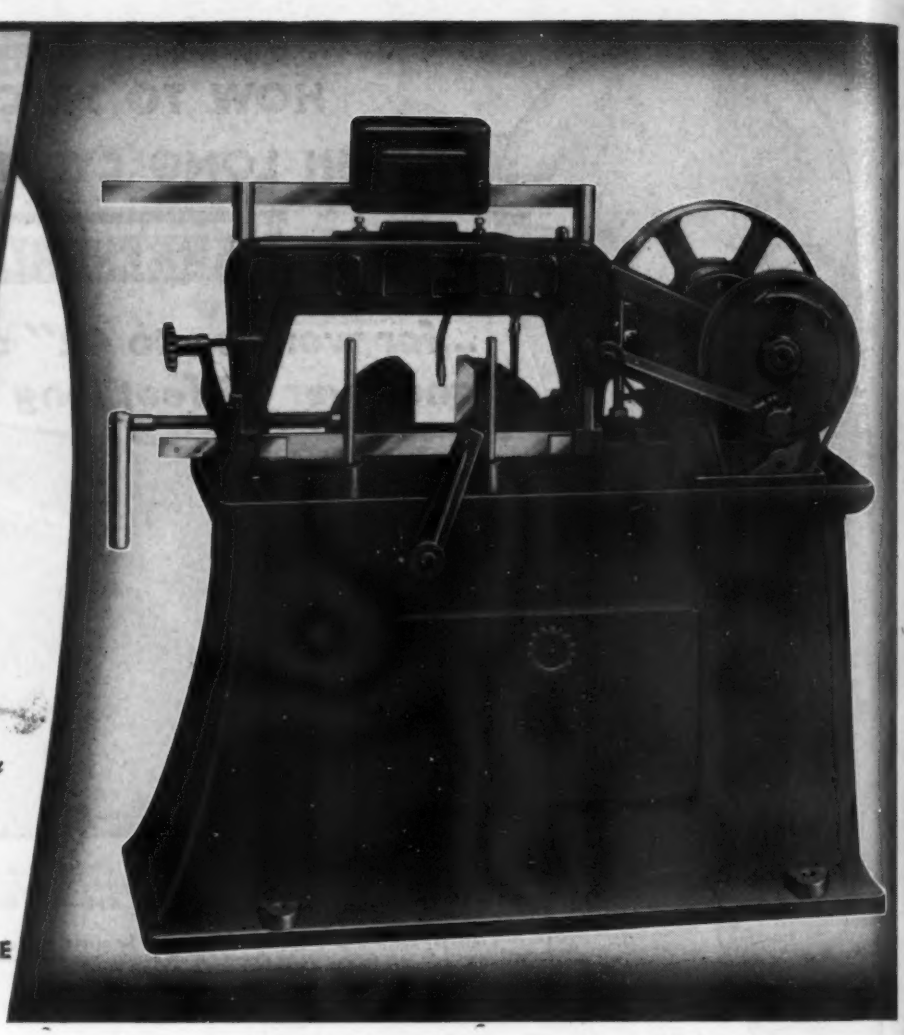
Low Price - High Quality

Immediate Delivery

The Ideal Saw for any Shop

GRAVITY FEED
LENGTH GAUGE
EXPANDING CLUTCH
DOVETAILED SAW FRAME GUIDE

$180.15



● Automatic trip stops machine on completion of cut . . . automatic relief of saw blade on non-cutting stroke . . . 6" x 6" capacity with 10" to 14" blades . . . Clutch pulley 12" x 3" . . . pulley speed 120 R.P.M. Saw frame is designed for maximum rigidity. Sliding bearing is dovetailed to fit arm and is adjustable in all directions. Belt drive type, $180.15.

Furnished on request, is the 3-speed V-belt Motor Drive arrangement to permit speed adjustments from 90 R.P.M. to 130 R.P.M.; motor, additional.

Motor recommended for use with drive arrangement— ½ H.P. standard speed, 1725 R.P.M.

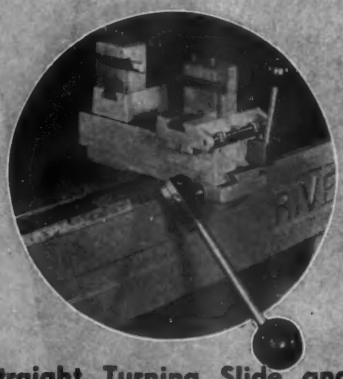
Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 5 N. ST. CLAIR ST. TOLEDO 4, OHIO

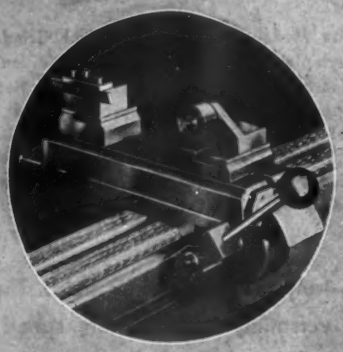
RIVETT

FOR BAR OR INDIVIDUALLY CHUCKED WORK REQUIRING UP TO EIGHT SUCCESSIVE OPERATIONS

Straight and Taper Turning Slides



Straight Turning Slide and Fixed Block



Cutting-Off and Forming Blocks

The Rivett No. 918 Hand Screw Machine incorporates precision, balanced design and operating features to make it an efficient producer on small duplicate parts. Work requiring up to eight successive operations can be finish-machined at one chucking. Bar stock passed through spindle may be held in push-out collet, while work individually chucked may be held in draw-in collet, step chuck or jaw chuck. In combination with six turret operations, double tool slide may be set up for straight or taper turning, forming or cutting-off.

Other combinations are available using chasing bar for internal or external threading, or compound slide rest with turret tool post. Steel cabinet mounting has rimmed top and sump for cutting oil. Bench mounting is optional.

SPECIFICATIONS

Swing over bed, dia.	8"
Distance between spindle mouth and face of turret	
With draw-in collet	14½"
With push-out collet	13½"
Collet capacity:	
Draw-in type, max. dia.	1"
Push-out type, max. dia.	1"
Step chuck capacity, max. dia.	6"
Jaw chuck capacity, max. dia.	6"
Spindle capacity, max. dia.	1⅛"
Travel of turret slide, max.	4½"
Number of tool holes in turret	6
Dia. and depth of tool holes	¾" x 1"
Swing over double tool slide	4½"
Cross travel of double tool slide	3"
Travel of straight turning slide	2¼"
Travel of taper turning slide	2¼"
Spindle speeds, eight forward and reverse:	
Low range	150 to 2500 r.p.m.
High range	225 to 3750 r.p.m.
Weight of hand screw machine, mounting and drive, net	900 lbs.

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS.

UNIVERSAL TOOL GRINDERS

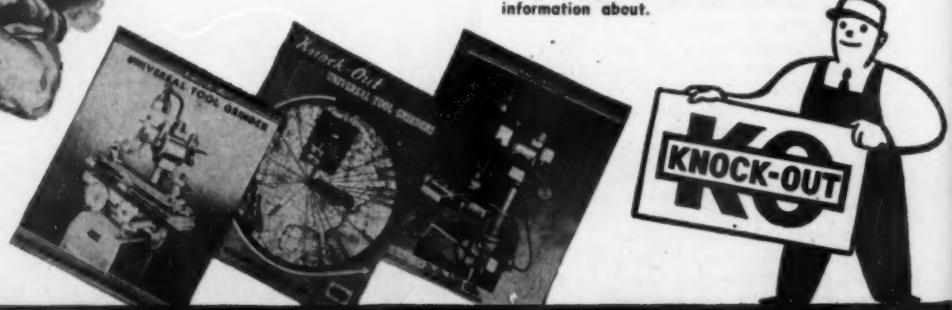
The *Knock-Out* Universal Tool Grinder is built for twenty four hour a day service on production or in tool room maintenance work. Model B600 is made to accommodate wet or dry grinding jobs. Model B602 is built for dry grinding jobs only. Specifications: Swing over table 6¼" (8¼" with raising blocks); distance between centers 17"; working surface of table 2⅜" x 22½".

Model B604 Universal Carbide Tool Grinder is built for fast and accurate grinding of conventional single point carbide tipped tools. This machine can be purchased complete to accommodate all grinding necessary on carbide tools, or as a Chip Breaker Grinder only (Model B603). It is equipped with the Universal Work Holding Fixture which can be readily re-set for repeat grinding of chip breakers.

The Model B660 Universal Tool Grinder with multiple speed head is a new addition to the *Knock-Out* family. With the "Speed Head" the operator can select the proper speed for the job. Nine speeds are available ranging from 1,000 to 11,000 RPM. Standard equipment includes nine assorted grinding wheels, four assorted pulleys, and four drive belts.

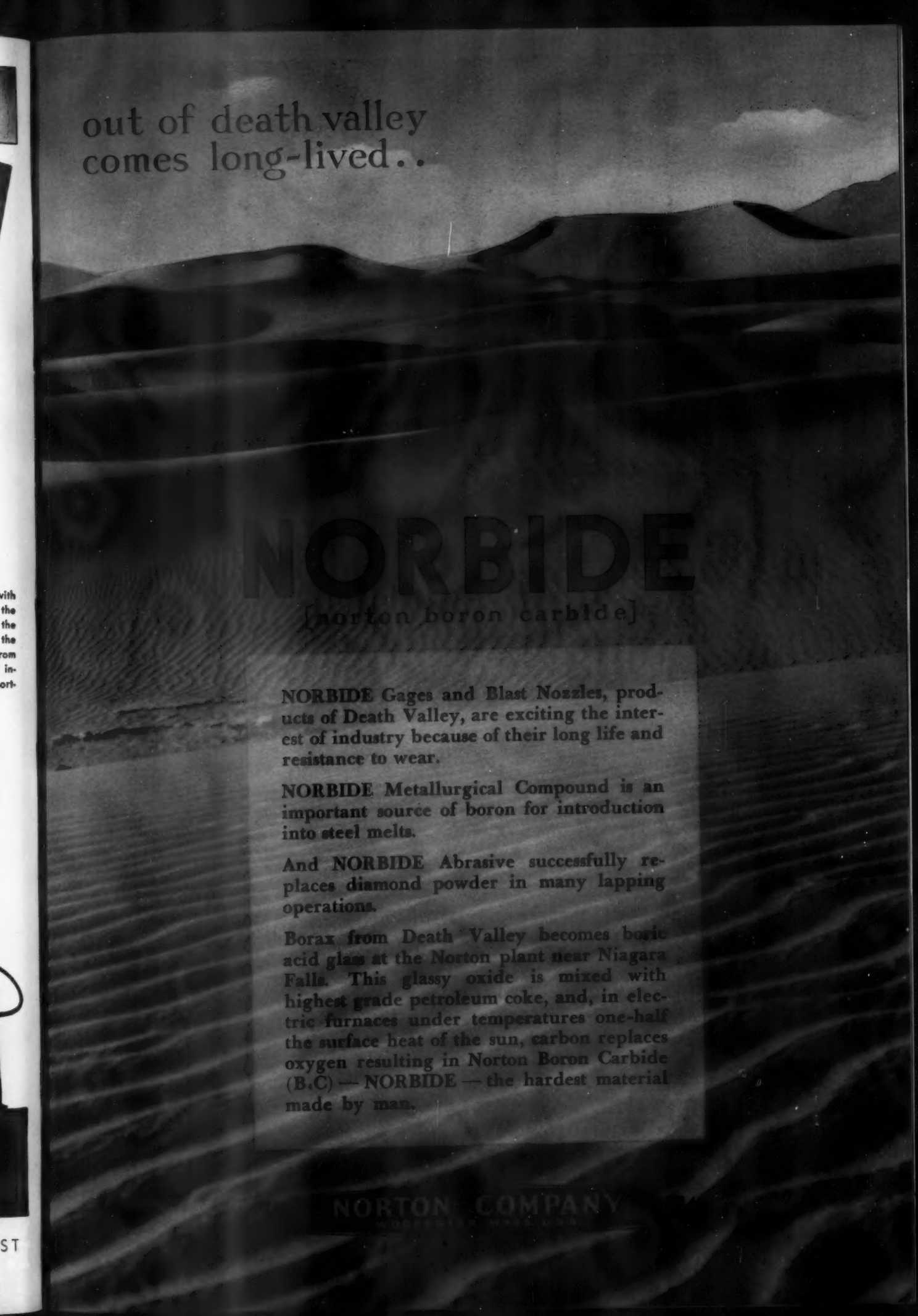
Knock-Out Grinders are truly leaders in their field. These machines offer the operator versatility of operation, speed in making set-ups, and economical grinding on both production and maintenance work. A large number of fixtures are available, any one of which can be applied to any K-O grinder without alteration to the machine.

Write for bulletins 27-74. Specify the grinder you wish to have more information about.



K. O. LEE COMPANY

ABERDEEN SOUTH DAKOTA


out of death valley
comes long-lived..
NORBIDE
[norton boron carbide]
NORBIDE Gages and Blast Nozzles, products of Death Valley, are exciting the interest of industry because of their long life and resistance to wear.
NORBIDE Metallurgical Compound is an important source of boron for introduction into steel melts.
And NORBIDE Abrasive successfully replaces diamond powder in many lapping operations.
Borax from Death Valley becomes boric acid glass at the Norton plant near Niagara Falls. This glassy oxide is mixed with highest grade petroleum coke, and, in electric furnaces under temperatures one-half the surface heat of the sun, carbon replaces oxygen resulting in Norton Boron Carbide (B_4C) — NORBIDE — the hardest material made by man.
NORTON COMPANY

Hardest material made by man

increases gage life more than 100 times

NORBIDE Gages are dramatically demonstrating their usefulness for precision measuring on production work. Extreme hardness and resistance to wear explain why NORBIDE plug, ring and dial indicator gages give such long service where conventional types of measuring devices quickly wear beyond the tolerances allowed.

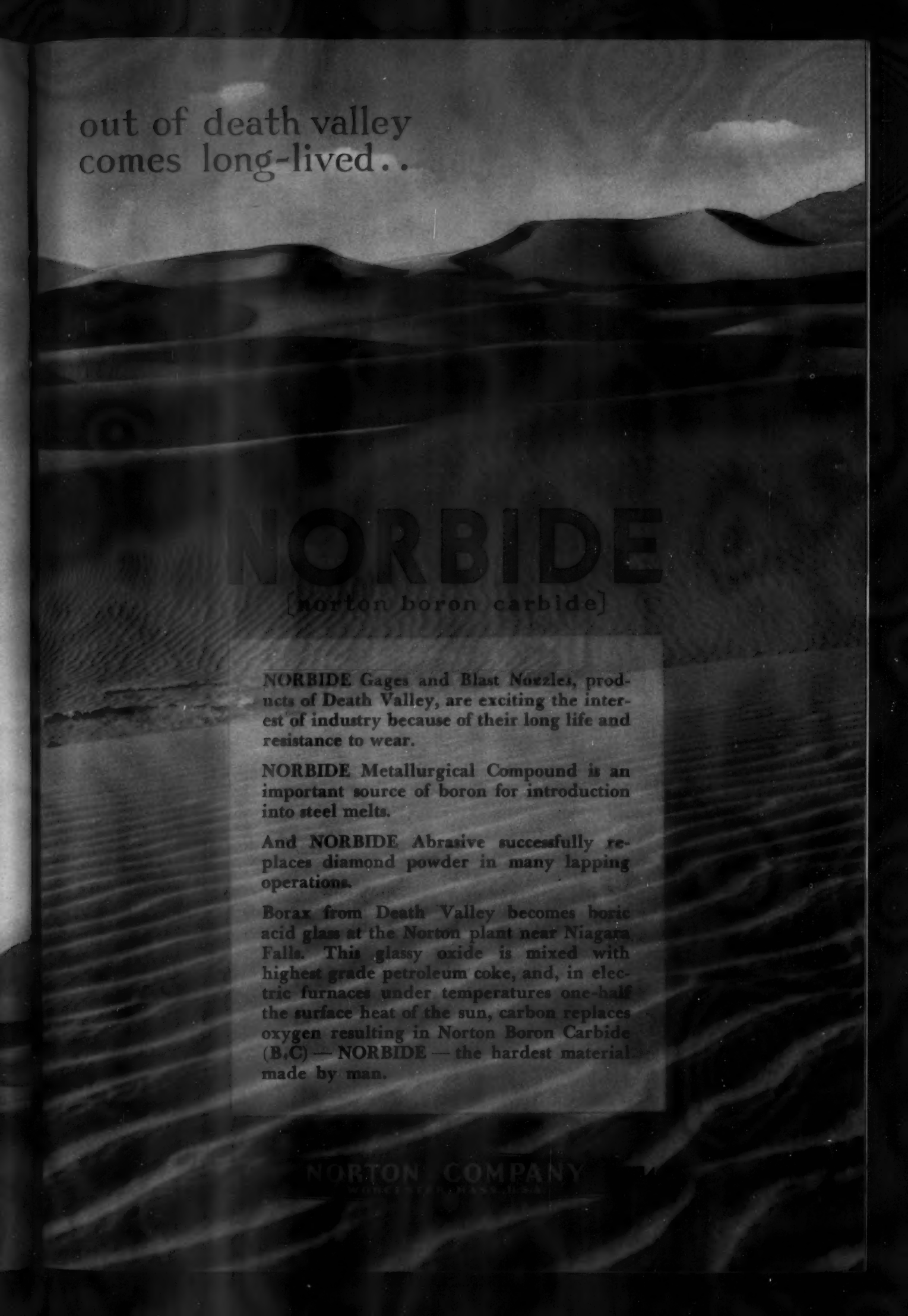
Norton Company supplies NORBIDE gage blanks to gage manufacturers and to concerns making their own gages. When next ordering from your regular supplier, request NORBIDE gages and prove to yourself how the hardest material made by man increases gage life one hundred times and more.

NORTON COMPANY, Worcester 6, Massachusetts

NORBIDE Liners increase the life of pressure blast nozzles hundreds of times. Because of resistance to wear the orifice of a NORBIDE Nozzle enlarges very gradually, thereby reducing air consumption and maintaining uniformity of stream contour.

NORBIDE Metallurgical Compound is an economical source of boron: for use as an easily available alloying element; for preventing decarburization and "soft skin" in tool steels; a chill-inducing element in cast irons; a deoxidizing agent in copper.

Extreme hardness makes NORBIDE Abrasive an economical substitute for diamond dust in lapping. It is extensively used for machine lapping of cemented carbide wire drawing dies, for flat lapping carbide and hardened steel tools, and for lapidary work.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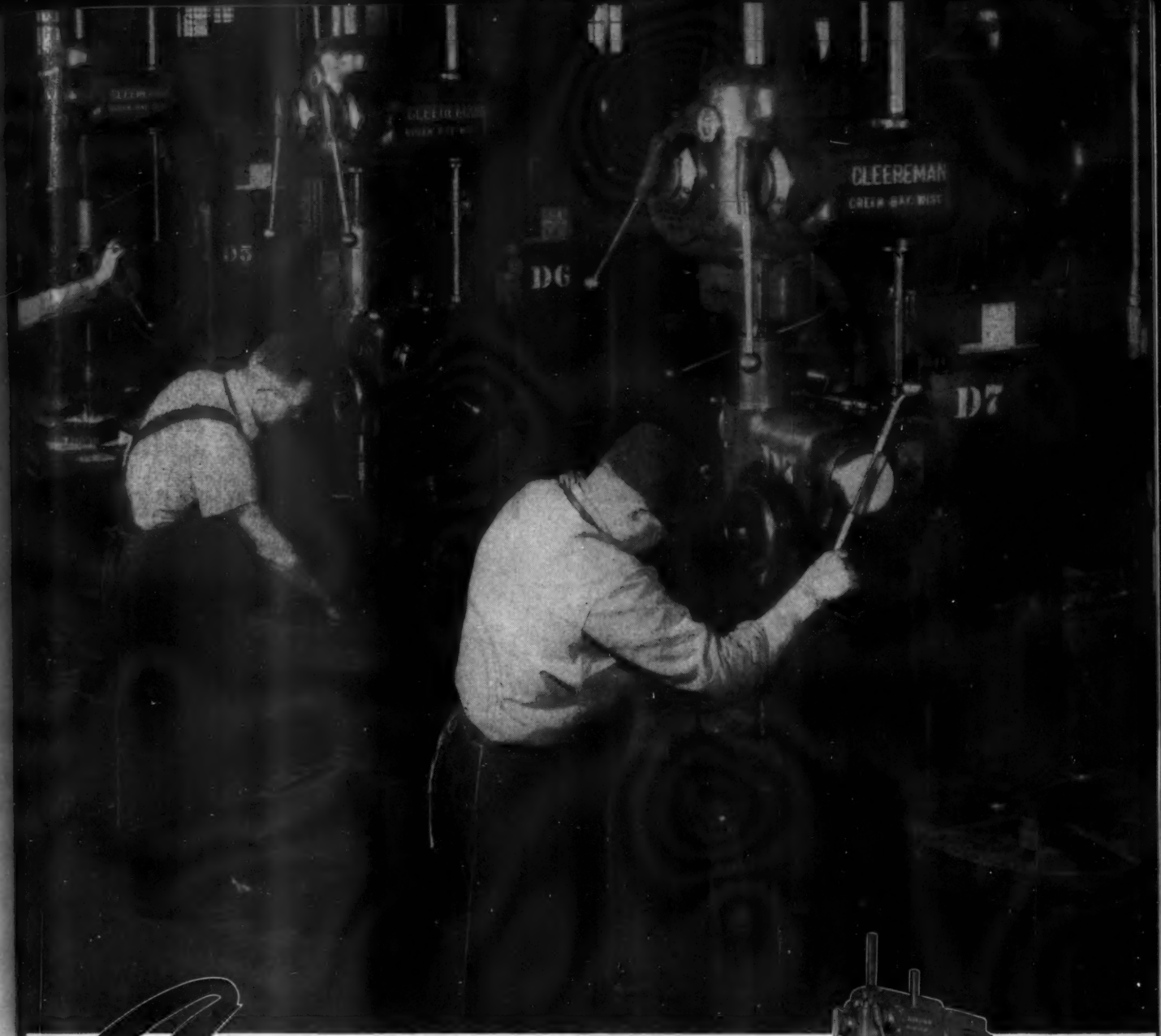


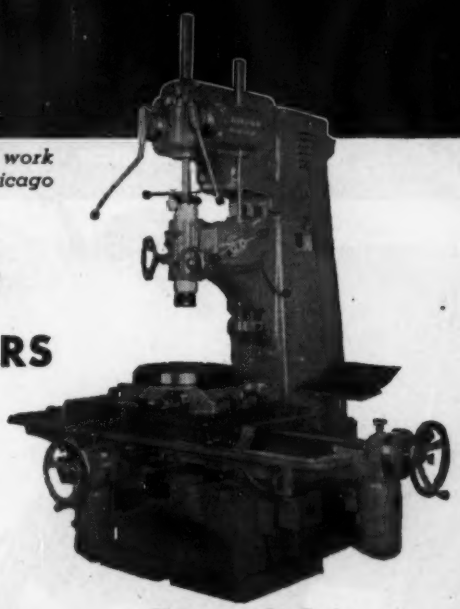
A battery of three Cleereman Drilling Machines at work in the plant of the Armstrong-Blum Mfg. Co., Chicago

Cleereman

DRILLING MACHINES AND JIG BORERS

Speed of operation, high efficiency, unexcelled accuracy, extreme range of adaptability, and long working life are the dividends collected by the many users of Cleereman Drilling Machines and Jig Borers.

Write for Catalog



Cleereman Jig Borer

BRYANT MACHINERY & ENGINEERING COMPANY

Associated with **CLEEREMAN MACHINE TOOL COMPANY**

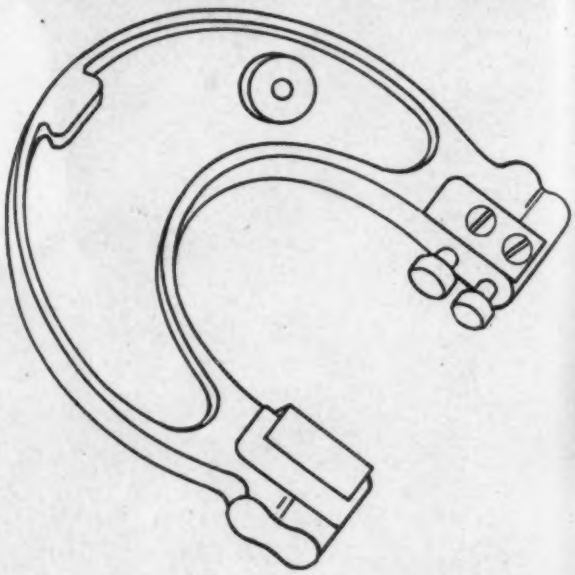
General Sales Offices **400 W. Madison St. • • • Chicago 6 • Ill. • U. S. A.**

Casting inspection

Hardness testing

Rigid inspection

...FROM RAW STEEL TO THE FINISHED MACHINE



Profilometer test for surface smoothness

Super-micrometer checking

ALL raw materials are inspected with the greatest of care. Castings must be accurate to keep machining time at a minimum. Every Defiance mechanic is capable of checking his work as it progresses and he is well supplied with all necessary instruments including a set of Johansson blocks in every department. In a plant doing a wide variety of large accurate work this procedure reduces spoilage, reworking and loss of set-up time.

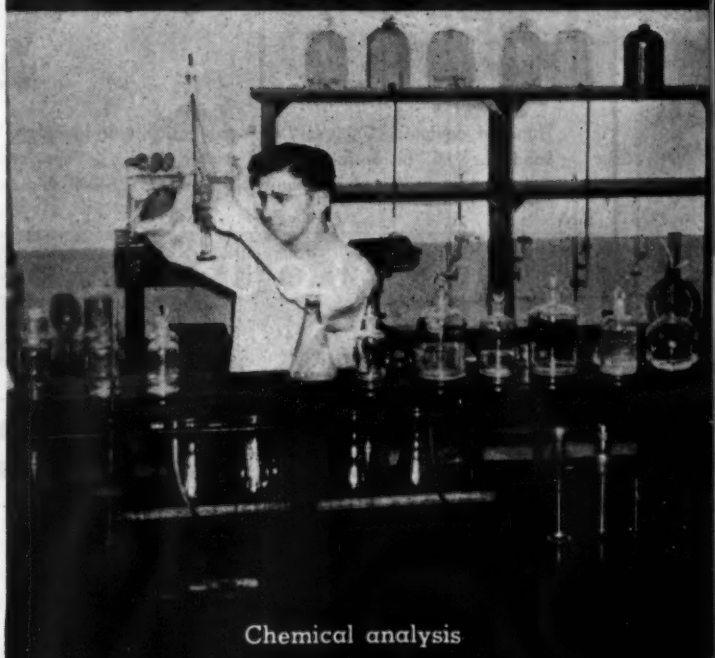
In addition to this checking on the job, the inspectors cover all critical items. They are all experienced mechanics equipped with the finest testing, gauging and checking equipment. This gives Defiance a double check on accuracy.

Defiance inspection procedure is rigid but not elaborate. It assures the proper results economically . . . Defiance Machine Works, Inc., Defiance, Ohio.

DEFIANCE

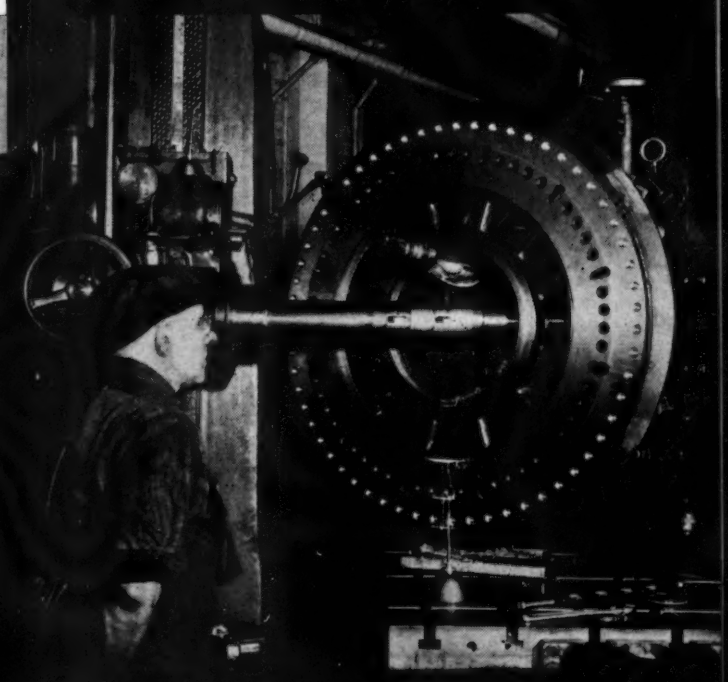
HORIZONTAL BORING MILLS ...AND A COMPLETE LINE OF DRILLING EQUIPMENT

Accurate measuring instruments are readily available to every mechanic



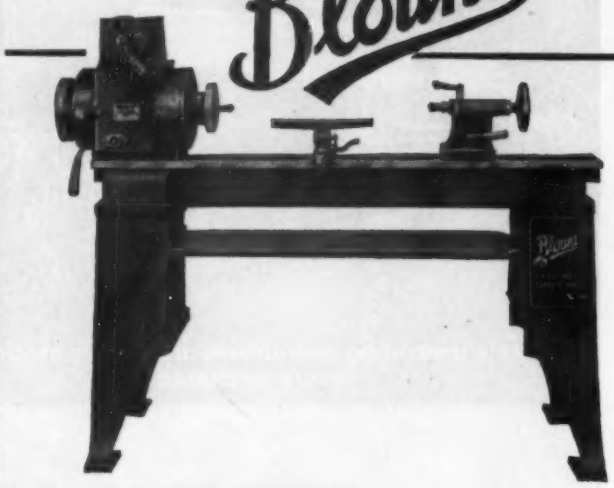
Chemical analysis

Final inspection



Typical example of accurately bored and spaced holes

"Blount" MOTOR HEADSTOCK LATHE



Offering increased production, ease of operation, quietness and safety . . .

Modern in every detail the Blount unit type Motor Headstock Lathe can be depended on for superior performance.

Motor headstock is of anti-friction bearing enclosed construction and aligned with the bed. Motor is a ½ H.P. ball-bearing 4-speed type, 220V, 3 phase, 60 cycle. Bed is designed for a 12" swing.

Controller, of enclosed dust-proof type, is provided with magnetic starter having overload and low voltage protection. Speed control handle conveniently located on front of headstock, makes standard spindle speeds of 600, 1200, 1800 and 3600 R.P.M. quickly and easily available. Combination mechanical break and cut-out switch and automatic disengaging spindle lock are provided.

Bed is of heavy construction, generously cross-braced for maximum stiffness, rigidity and balance. Standard bed lengths of 4', 5', 6', 7' and 8' are available.

Tailstock is of open-side design, lever-clamped to bed. Stock is self-ejecting. A rugged quick action tool rest provides ample surface for all jobs. Cabinet type legs provide convenient storage space.

Complete detailed specifications available on request—Ask for Bulletin D-17.

Standard equipment includes: 8" combination rear faceplate and hand wheel, 6" inside faceplate, 3" screw chuck, ¾" spur center, ¾" cup center, 7" and 10" hand tool rests and 2½"x4" angle rest.

J. G. BLOUNT CO.
Everett, Mass., U. S. A.

PORTAGE

NO. 4

HORIZONTAL BORING DRILLING & MILLING MACHINE

• Designed and built to meet the need for speed and accuracy demanded of today's production.

WRITE TODAY

for fully illustrated bulletin giving detailed description of the many features of this Horziontal Boring, Drilling and Milling Machine. No obligation.

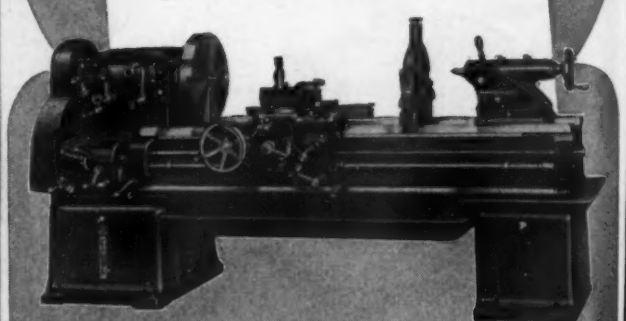
THE PORTAGE MACHINE CO.
AKRON 11, OHIO

Metalmaster

12", 14" & 16" LATHES

Offer: Infinite range of threads and feeds. Easy gear adjustment. Independent motor mounting. Short, direct drive. One control for all threads. Ample power for heaviest cuts. Automatic stop for feeds.

Catalogs sent on request. Write for yours!



The BRADFORD MACHINE TOOL Co

MANUFACTURERS OF METAL WORKING LATHES; CAM FEED DRILLING AND TAPPING EQUIPMENT, HYDRAULIC DRILLING MACHINES . . . IN BUSINESS SINCE 1840

659 EVANS AVE. . . . CINCINNATI, OHIO

. . . who is wondering what he'll be up against when Postwar Markets and Production open up! . . .

Maybe the first flood of postwar buying will gobble up anything and everything that's available, just so long as it satisfies the immediate and pressing need.

But, that won't last forever. Pretty soon the public will be its old critical self again, looking thoughtfully at quality, looking hard at the price tag, shopping around for the big buy.

Now—one of the good things that has come out of this war is the widespread recognition of the special-purpose machine's ability to boost production and quality and cut costs. This ability was well known to many before the war. Now, it is known to many others whose prewar line-up of standard machines couldn't cope with war-time production demands and who found in special-purpose machines the logical —and the only—answer.

How far will those organizations go (perhaps yours among them) in applying war-time experience to postwar production? Will the old prewar machines go back in the line? Or, will their place be filled by special-purpose equipment in which a series of operations are performed automatically in a fraction of the former time—tolerances accurately held—specified finish maintained—costs lowered substantially?

Such achievements have been common in war production. They can be just as common in postwar production. They MUST be, if we are going to have volume markets—and the prosperity that goes with them.

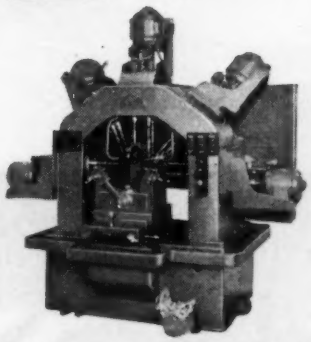
But, they won't happen automatically. Somebody must DO something about them to MAKE them happen. One good way is to call in Snyder and get the benefit of 20 years experience in solving production and cost problems.

And, of course, the time to do this is NOW. Machines can be designed now, built when present restrictions are lifted and installed, ready to produce as soon as materials are available. *Snyder Tool & Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Michigan.*

SNYDER

DESIGNERS AND BUILDERS OF SPECIAL-PURPOSE MACHINES FOR HIGH PRODUCTION AT LOW UNIT COST

PLAN Your PRODUCTION when you PLAN Your PRODUCT



SNYDER KNOWS HOW

This special-purpose, automatic cycle machine, designed and built by Snyder for multiple direction tapping in aircraft cylinder heads, is made with varying numbers of taping units and various combinations of single and multiple spindle heads.

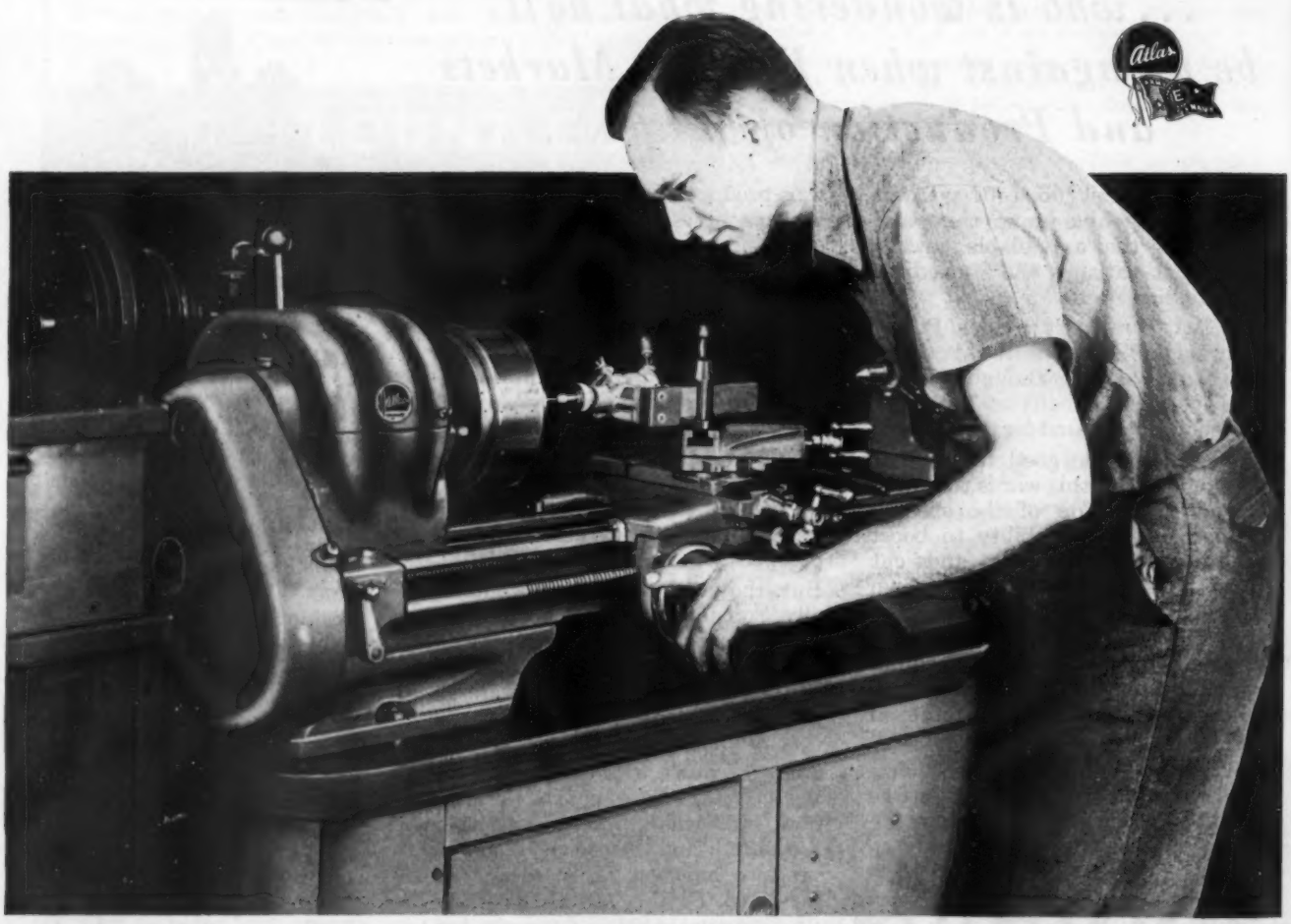
With fixture table in forward position for loading, safety limit switch is automatically held open. Rolling table into working position and accurately locating with index pin closes switch. Tapping units consist of two parts—motor mounting bracket, first reduction gear unit, limit switches and controls. This part is uniform on all machines. Head on any tapping unit may carry one, two, three or four lead screw spindles.

Lead screw spindles are hardened and ground sleeves operating in Ampco bronze bushings, adjustable for wear. Each tapping head is equipped with individual set-up control button which is inoperative when machine is on automatic cycle.

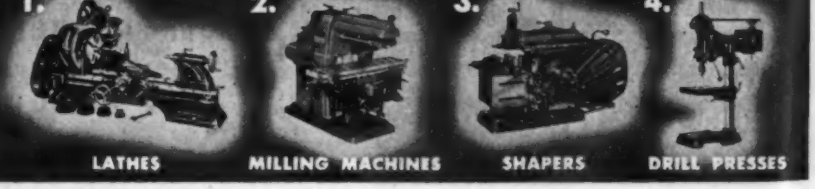
20 Years of Successful Co-operation with Leading American Industries

ATLAS 10" LATHES HAVE PROVED THEIR DEPENDABILITY

Rushed into action when larger machine tools were unavailable, Atlas 10" lathes have proved their precision dependability in war plants all over the nation. Tool room superintendents and production chiefs have learned that Atlas lathes can perform hundreds of jobs with far greater efficiency and economy than larger, more expensive machines. That's why these compact tools are coming into greater and greater prominence in post-war planning where operating flexibility and low machine-hour costs will be important factors. Send for the new 1944 catalog. Atlas Press Co., 704 N. Pitcher St., Kalamazoo 13D, Mich.

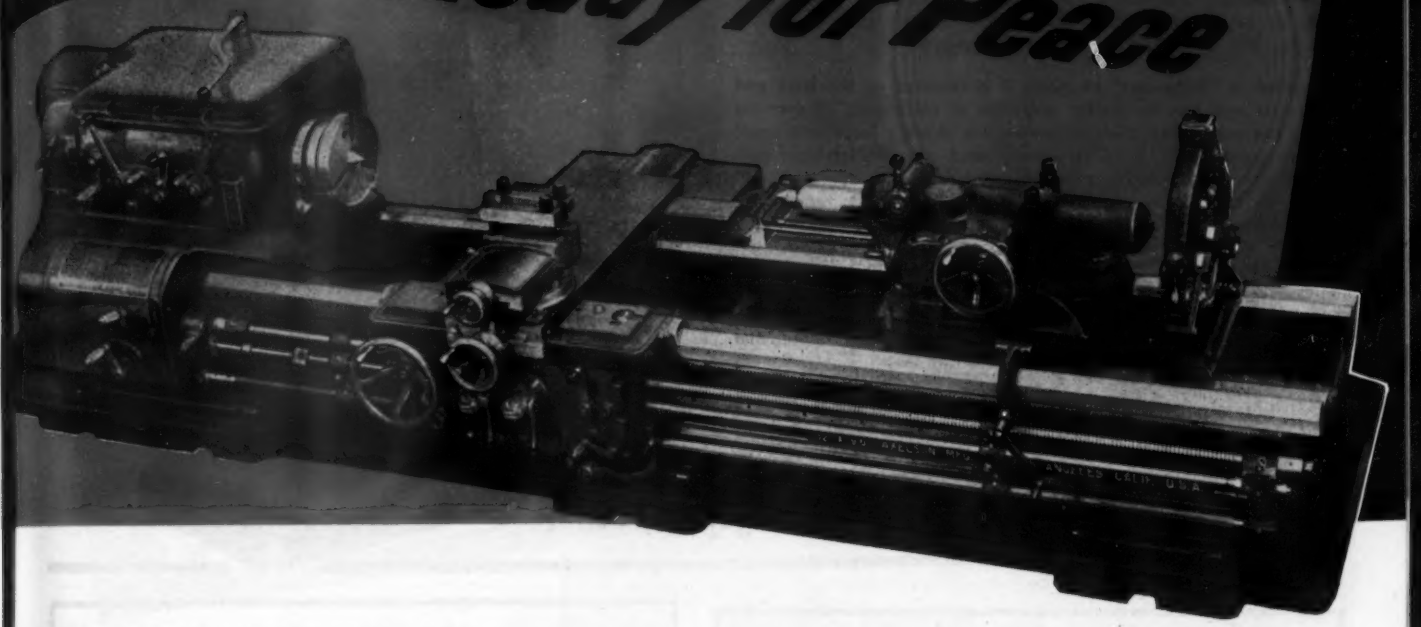


Atlas 4 TOOL TEAM FOR SMALL-PARTS MACHINING



THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

Tested in War.. Ready for Peace



American machine tools have played a leading role all over the world in beating the Axis at its own game of mechanized warfare... Heavy-duty lathes are out in front in this production war... *Axelson Lathes* are in the blue-ribbon class for they have come by their recognized merit through more than thirty years of constant improvement... At no period in history have lathes been called upon to deliver such fast precision metal turning on heavy schedules as during this global war... *Axelson Lathes* have come through with flying colors for speed, versatility, precision, durability and low maintenance... In the vast reconstruction that will follow Peace, *Axelson Lathes* are ready to go on to new triumphs of performance... These triumphs will be assured by the scrupulous engineering and craftsmanship which blend with metallurgical science in Axelson lathe construction.

AXELSON LATHES, of various lengths, are manufactured in 14, 16, 20, 25 and 32-in. sizes

ARMY E NAVY

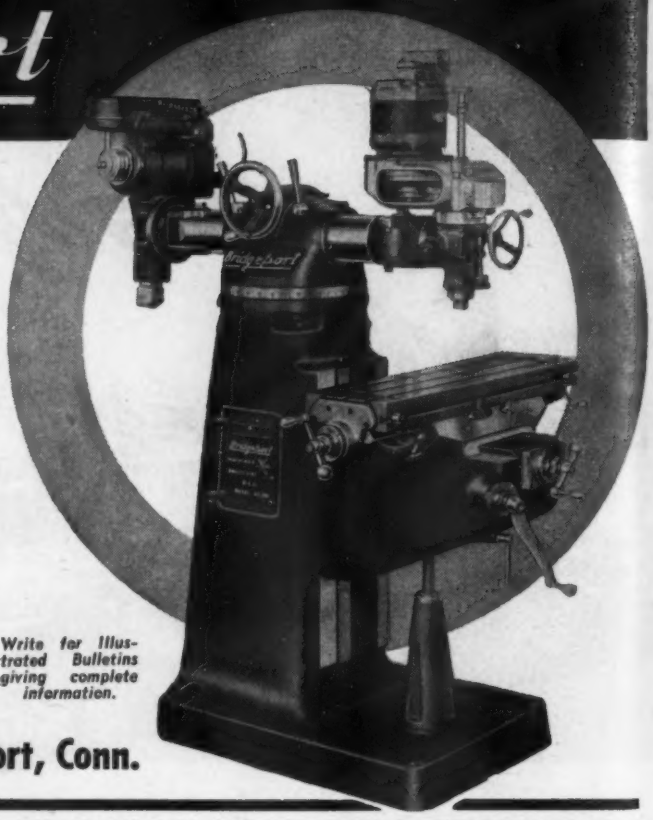
AXELSON MANUFACTURING COMPANY

6160 Boyle Avenue, (Box 98 Vernon Station) Los Angeles 11, Calif. • 50 Church St., New York City • 3844 Walsh Street, St. Louis, Missouri

AXELSON LATHES

Dependable for over a Quarter Century

Announcing a new shaping attachment by Bridgeport



This new sturdy accurate attachment — for which a tremendous demand has existed — is at last in production and available for use on existing Bridgeport Turret Milling Machines now in the hands of users. It can also be mounted on all types of milling machines and on special production equipment.

As applied to "Bridgeport" machines it is mounted on the back end of overarm and can be set for operation at all angles. It provides a fast, convenient and practical means for shaping large and small die and mold work. It is extensively used also on intricate production jobs where slotting operations are necessary.

The Bridgeport Turret Milling Machine — a machine of outstanding versatility and flexibility — features the Bridgeport Milling Attachment which enables it to handle drilling, boring and milling at all angles without changing set-up of work. All modern features of the conventional milling machine are available which with this attachment makes the Bridgeport a universal machine of unparalleled utility.

Bridgeport High Speed Milling Attachments, like the Shaping Attachment, can be mounted on milling machines of all types and on many types of special production equipment.

Write for Illustrated Bulletins giving complete information.

THE BRIDGEPORT MACHINES, Inc., Bridgeport, Conn.

REED TYPE 50
HIGH SPEED — BALL BEARING SENSITIVE DRILLS

Complete description and specifications available on request.

Convenient, Safe, Simple and Accurate

These machines are available with any number of spindles and on multiple spindle units a separate motor and drive are provided for each spindle.

Instant speed adjustment gives an infinite range of speed from 440 to 3000 R.P.M. with speed shown at all times on a speed indicator which is an integral part of the machine. There are no exposed parts except the drill chuck itself, a safety feature which will be greatly appreciated in shops employing women operators.

These machines can be depended on for close precision, high efficiency, speed and convenience.

SPECIFICATIONS

Capacity: ¾"
Spindle Travel: 6"
Adjustment of Head: 6½"
Spindle Drain: ⅞"
Table Surface: 15⅜" x 16"
Spindle Nose to Table: 26"
Table Adjustment: 12"
Motor: ¾ HP

PRODUCTION MACHINE CO.
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

KNIGHT — VERSATILE · ACCURATE · RIGID — MILLERS

FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE

W. B. KNIGHT MACHINERY CO.
ST. LOUIS MISSOURI

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

MILLHOLLAND

Automatic DRILLING - BORING MILLING - TAPPING Units

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

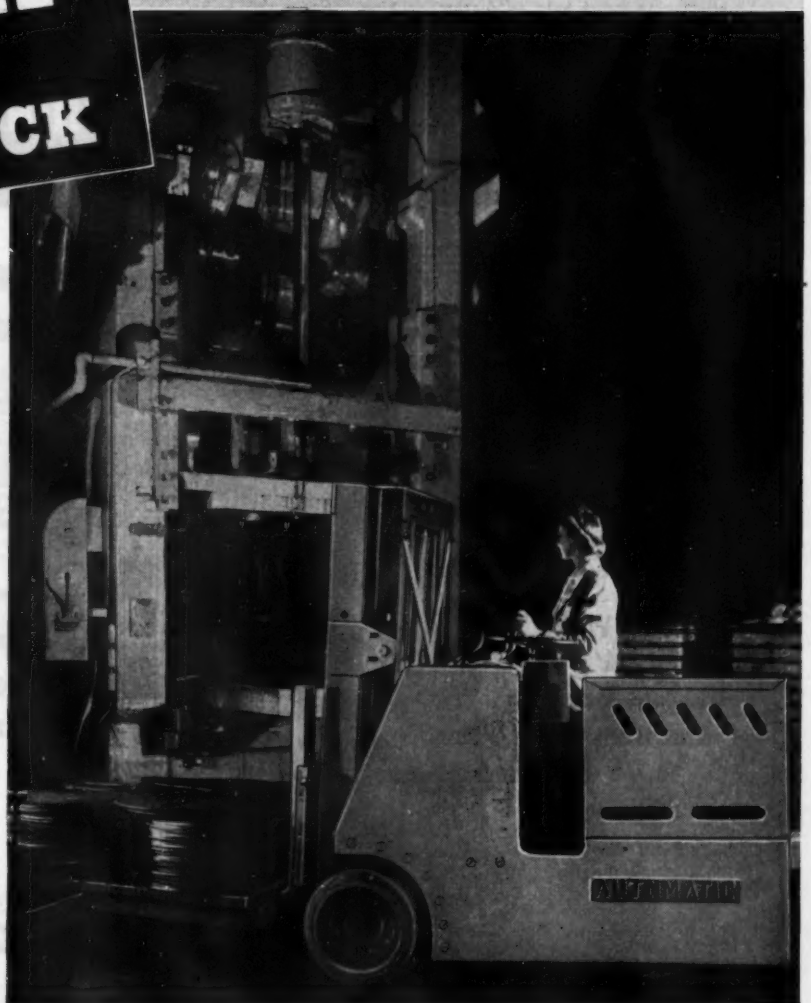
FAST MOVING

MATERIAL HANDLING *System*

FROM RECEIVING THROUGH PROCESS . . .

★ The employment of "AUTOMATIC" Tiering Fork Trucks in handling sheet stock from its arrival through various processes of manufacture is a definite answer to efficiency as well as low costs. Both Pallet Platforms and Skid Boxes are used.

TRADE **AUTOMATIC** MARK
Tiering
FORK TRUCK



Sheet stock is quickly unloaded from the box cars, taken directly to storage and tiered by an "AUTOMATIC" thereby eliminating needless handling and delay. Ceiling space is utilized and high, orderly stacks are quickly and easily accessible.

The "AUTOMATIC" illustrated delivers sheet stock to a blanking press, then delivers the discs to the next operation. A continuous flow of work is thus maintained at low cost.

. . . Find out just how you can apply the "AUTOMATIC" Tiering Fork Truck to your handling needs —write today.

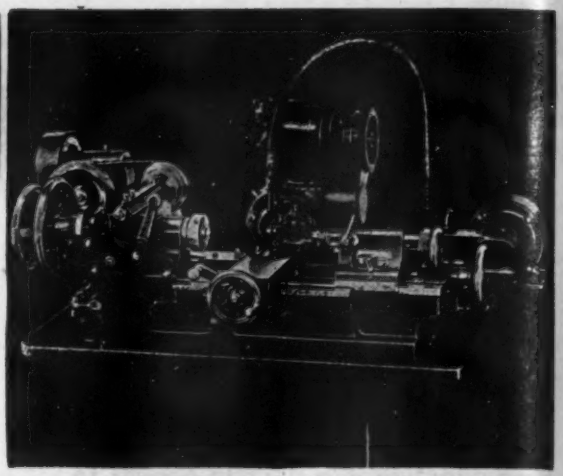
MANUFACTURERS FOR OVER THIRTY FIVE YEARS *Electric Propelled* INDUSTRIAL TRUCKS

AUTOMATIC TRANSPORTATION CO.

59 WEST 87th STREET — DIV. OF THE YALE & TOWNE MFG. CO. — CHICAGO 20, ILLINOIS

WALTHAM THREAD MILLERS

are designed especially for small work requiring close tolerances



Improvements in the design of these machines involve the use of three motors which provide individual speed change and reverse for cutter and work as well as constant speed for pump. Greater rigidity of cutter head and increased speed range have also been achieved. These machines can be arranged with speeds suitable for either brass or steel and by changing ratios can be used for both.

Standard equipment includes machine mounted on cabinet base, motors with push button start and automatic or push button stop, follow rest, milling cutter, and indexing device for cutting multiple threads.

SPECIFICATIONS

Swing over carriage 3"H

Capacity (Diameter of work) 2" or smaller

Thread length (work held on centers) 8¾"

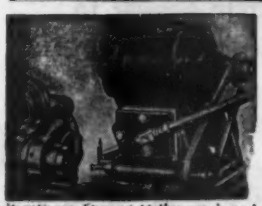
Thread length (work held in spring chuck at one end) 10"

Diam. hole through spring chuck ⅝"

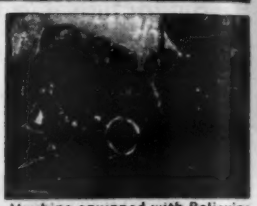
Dia. hole through work spindle ¾"

Floor Space 48" x 34"

Motors: 1/3-1/4 and 1/6 HP



Waltham Thread Miller equipped with Internal Threading Attachment



Machine equipped with Relieving Attachment

Send for literature giving complete information.

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WALTHAM, MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

LEACH External Grinder

PRICE

$875.00

Fully Equipped

Our dealers will help you fill out necessity priority forms.

Write us today for your nearest dealer's name and address.

Grinds Work from ¾" to 11" in length and from ⅛" to 7" in diameter.

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Agents in all Principal Cities Throughout the World

FIDELITY

Double-End Screw Traverse Spooling Machine . . .

For multiple-end winding of fine wires—sizes .008 to .030 up to twelve ends on each spool.

Delivers a smooth, uniform lay at speeds from 40 to 800 feet per minute—depending on size and kind of wire.

Tension and brake control prevent overrunning; slow acceleration avoids wire breakage, and adjustments provide for various wire sizes and types.

New catalog of FIDELITY Wire Spoolers describes other units. Write for it.

Buy Bonds to bring the boys down the Home Stretch

33 YEARS' EXPERIENCE

Intricate, Automatic Precision Machines

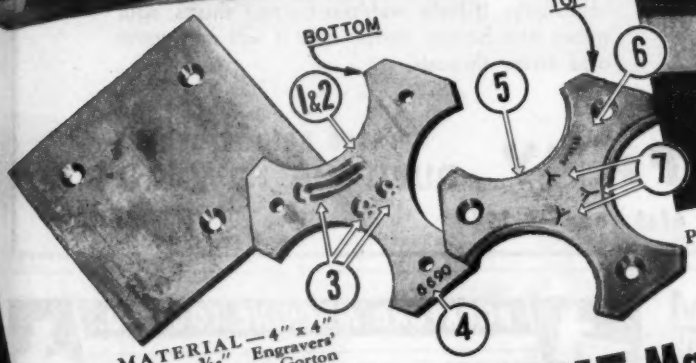
FIDELITY MACHINE COMPANY

3908-18 FRANKFORD AVENUE, PHILADELPHIA 24, PA.

GORTON

SPECIALISTS FOR OVER 50 YEARS IN

Tracer-Controlled MILLING



MATERIAL—4" x 4" square, 3/16" Brass, as it comes to Gorton Pantograph, with three holes drilled, countersunk.

PROFILING...SLOTTING...ENGRAVING, etc. *with Unskilled Operator*

Seven Operations on ONE Machine...from 1 Master

Showing VERSATILITY of GORTON PANTOGRAPH Tracer-Control . . .

ONE GORTON 3-Z PANTOGRAPH now performs work of several machines, eliminating various tools and fixtures formerly required—saving time and expense of separate machine set-ups and tooling.

SIMPLY BY CHANGING CUTTERS AND TRACING on both sides of a single, Flat Template (Master)—both top and bottom of this intricate part are completed within specified tolerances of ±.0025"—a total of 7 operations, in ⅓ previous time.

JOB IN BRIEF

PART—Indicator Plate.

7 OPERATIONS—(1) ROUGH MILL three arc sections...(2) FINISH-MILL sections...(3) MILL semi-circular groove and two 5/32" counter-bores...(4) ENGRAVE Part Number ...(5) Reverse Master and Part, PROFILE three U-shaped grooves along arc edges...(6) ENGRAVE word "SPREAD" and (7) ENGRAVE three Y-SLOTS to penetrate counter-bores.

CUTTERS—(only 4 needed)—Single Flute, straight-shank End Mills.

SPEEDS—Up to 9,200 r.p.m.

ENGINEERING SERVICE . . . FREE

Find out how Gorton Tracer-Control Machines can pay for themselves in time and man-power savings like this in your shop...how they can perform multiple operations, freeing other machines for new work and increase production.

SUBMIT ANY PROBLEM—Send a sample part, prints, or specifications to your nearest Gorton dealer, or to the Gorton Factory at Racine, Wis. No obligation.

The *Right* Size The *Right* Type of Machine for Every Job . . .

From 2 oz. to 2 ton DIE BLOCKS

Tracer-Controlled MILLING

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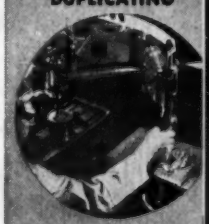

Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON ARMY E NAVY

GORTON *Precision* MACHINES

CUTTER GRINDERS
ENGRAVING MACHINES
3 & 2 Dimensional PANTOGRAPHS
Vertical & Universal Head Super-Speed MILLERS
Manual & Electric Control DUPLICATORS

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- ☐ Condensed Catalog
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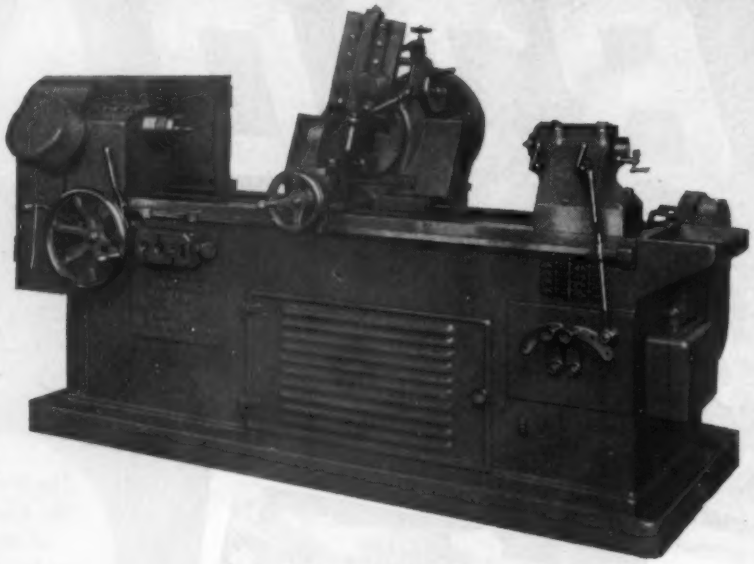

The ADAMS Gear Hobber and Thread Miller

The Adams Manufacturing Hobber is available when there is a sufficient volume of splined shaft and spur gear hobbing to warrant the purchase of equipment for these operations only.

Here is a machine that combines precision with versatility. It hobs multiple splined shafts, spur gears and helical gears, and it will mill worm and screw threads.

THE ADAMS COMPANY 1905 BRIDGE STREET DUBUQUE, IOWA, U.S.A.

1883 — Our 61st Year — 1944

LM LM

REID Automatic Feed Surface Grinder No. 2A

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Write us today for your nearest dealer's name and address.

A Proven Product for Over a Quarter Century with Thousands in Use Daily

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Shapers . . Planers . . Slotters . . Shaper-Planers
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For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

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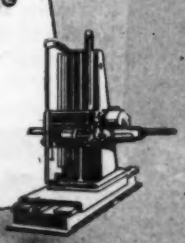

DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

When You Order Your Favorite Brand of HACK SAW BLADES Specify this—

"made from INGERSOLL D-B-L STEEL"

5 YEARS EXPERIENCE

in the Production of this Lower Cost Type of

HIGH SPEED STEEL *for* HACK SAW BLADES

★ ★ ★ ★ ★

Specify Ingersoll D-B-L Steel for your Hack Saw Blades on its 5-year Record of Past Performance.

INGERSOLL D-B-L

(Tungsten . . . . . 5.00-6.00)
(Molybdenum . . 4.00-5.00)

The remarkable performance of Ingersoll D-B-L . . . its relative freedom from decarburization . . . its tough cutting quality and its high impact resistance . . . plus its lower cost, have made it a wartime favorite.

A Borg-Warner Product

INGERSOLL STEEL & DISC DIVISION
BORG-WARNER CORPORATION
NEW CASTLE, INDIANA
Plants: New Castle, Ind.; Chicago, Ill.; Kalamazoo, Mich.

INGERSOLL SPECIAL STEELS FOR SPECIAL USES

Alloy Steels
Armor Plate
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Stainless Steels and Saw Steels, including "18-4-1" and Molybdenum and D-B-L Hack Saw Steels

With production changeovers, you will appreciate the versatility of ARTER ROTARY SURFACE GRINDERS. At the left are typical examples of the wide variety of products which are being successfully ground by ARTERS.

ARTER engineers stand ready to help you to get the most out of your machines, and to suggest grinding methods by which your products can be kept at top speed in the days of industrial development — in the new era which the dawn of Victory will bring to American industrialists.

Capacities 8" to 40".

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.

CARLTON RADIAL DRILL

"Anti-friction Bearings Throughout"

FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The **CARLTON**

MACHINE TOOL COMPANY

CINCINNATI, OHIO, U. S. A.

SAVE TIME with NICHOLSON

E-X-P-A-N-D-I-N-G

MANDRELS

You also PROMOTE PRECISION when you equip your shop with these economy tools for holding work while being machined. Hardened tool steel; precision ground.

2 types, all sizes; singly or sets. Prompt delivery. Bulletin 1043.

Other Products: Arbor Presses, Control Valves, Steam Traps, etc.

W. H. NICHOLSON & CO.

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Investigate the possibilities offered you through advertising in the CONTRACT WORK SECTION!

For details, write

DEPARTMENTAL STAFF

American Machinist, 330 W. 42nd St., New York 18, N. Y.

DoALL Cuts Solid Steel Cylinder "Like a Loaf of Bread"

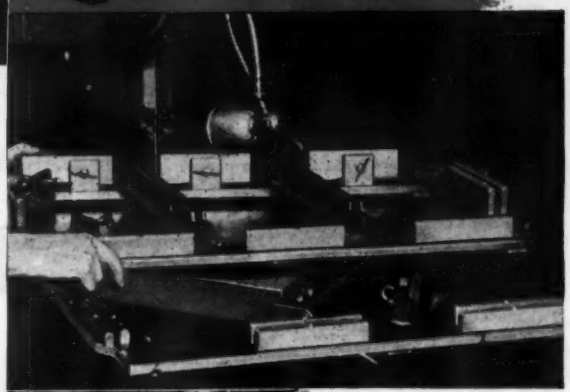
That's what this operator at a large Aviation Plant says, and he ought to know, because for the past three years he has been doing all kinds of time-saving DoALL contour and straight cutting, a few examples of which are shown here.

Soon Pays for Itself

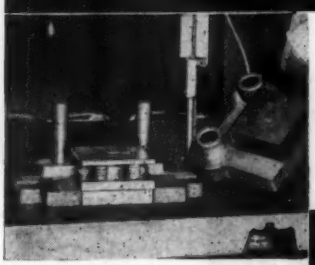
The DoALL Contour Machine is such a versatile tool that its cost is quickly paid by speeding up all kinds of internal and external sawing, saving thousands of valuable man hours. Cuts, files and finishes any metal, alloy, plastic, plymetal, wood or laminated material.

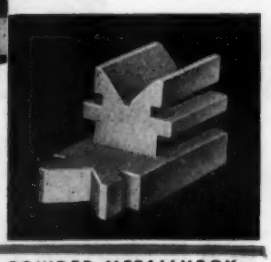
Indispensable in tool room, machine shop or on regular production line. Six models, priced from $1,000 to $5,000 with motors.

CONTOUR SAWING BOOK — 265 pages of short cuts to better machining, and other helpful data. Send for copy.



Jig for building plane doors made from steel cut and filed on a DoALL.





Above—Precision Die for stamping fuel tank "patch".
Right—A fine job of angle cutting. V Block cut, filed and finished on a DoALL.

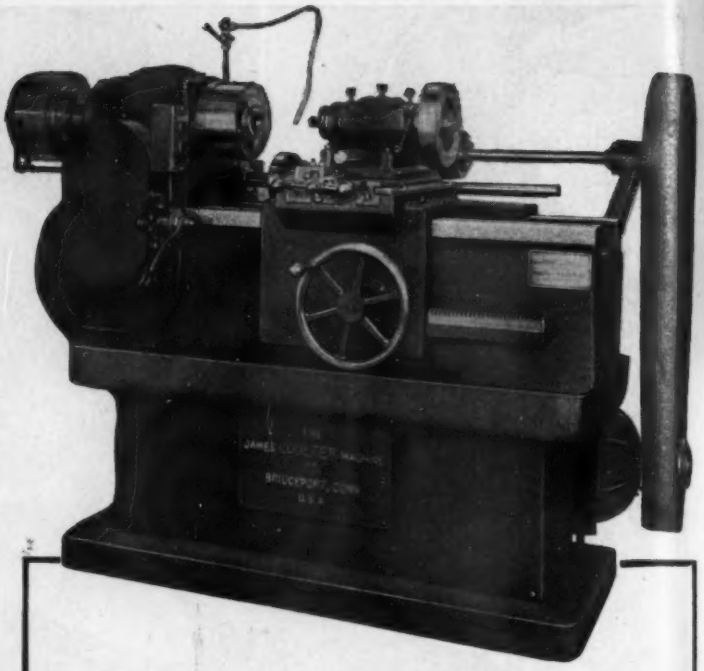
DoALL

INDUSTRY'S NEW SET OF TOOLS

CONTINENTAL MACHINES, INC.
1310 South Washington Avenue • Minneapolis 4, Minn.

Sales & Service Offices: Baltimore, Boston, Chicago, Cleveland, Denver, Detroit, Erie, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Orlando, Philadelphia, Pittsburgh, Portland, Rochester, Rockford, St. Louis, Salt Lake City, San Francisco, Seattle, Spokane, Toledo, Tulsa, West Hartford.

Keep Ahead of DEFENSE DEMANDS on the PRODUCTION of EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James COULTER Machine Co.

BRIDGEPORT · CONNECTICUT · U.S.A.

Save Time . . . Cut Costs

Remarkably fast cutting of Metals is assured by

PORTER-McLEOD COLD METAL SAWING MACHINE

Cutting of metal stock is put on a really high production basis by this powerful, conveniently handled, clean, fast and accurately cutting Porter-McLeod machine. It can be depended on to save time on the wide range of stock cutting involved in war work.

In addition to its capacity for handling up to 8" round or 7½" square stock, this machine is provided with a unique method of holding work which enables it to nest economical quantities of bars and shapes for multiple cutting. All cutting is fast because a 3" per minute feed is provided.

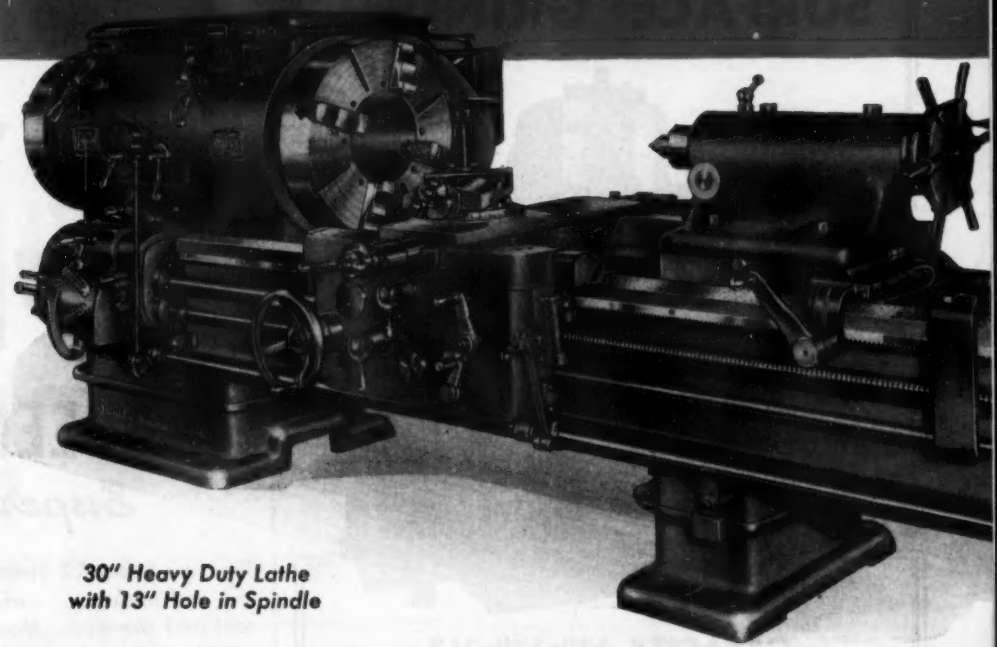
Fast, accurate work and long blade wear are made possible by an upward feeding of specially designed and supported blade and by a friction disc feed.

Outline your cutting-off problem and ask for our recommendations to solve it. Send at once for Descriptive Bulletin on the 8" Porter-McLeod cold metal sawing machine.

PORTER-McLEOD MACHINE TOOL CO., INC.

HATFIELD, MASS., U.S.A.

Do You Run A Temperature Over Certain Machining Jobs?



30" Heavy Duty Lathe with 13" Hole in Spindle

* Solve Your Problems with a

HYDRATROL LATHE

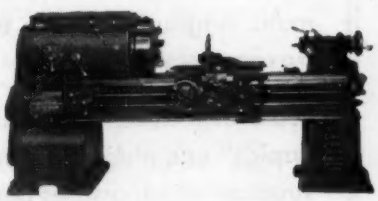
Large Hollow Spindle Type

For Faster Production- Better Work- Lower Costs!

☆ ☆ ☆

Shop after shop is finding that it can do many machining jobs *better* with a *Large Hollow Spindle Type* of HYDRATROL LATHE. In these shops, the results of installing a HYDRATROL are invariably faster production, better work, lower costs.

Maybe YOU can "do it better" on a HYDRATROL LATHE. Why not send us prints of your difficult, unusual or too-costly jobs, for a specific, time-and-money-saving recommendation.



18" Lathe with 7 1/8" Hole in Spindle

FIVE SIZES—18" TO 36"

Small . . . . 18" up to 7 1/4" Hole
Medium . . . . 24" up to 12" Hole
Large . . . . . 27" up to 13" Hole
Large . . . . . 30" up to 14" Hole
Large . . . 36" up to 16 1/2" Hole
(Standard type lathes, 16" to 36")

Lehmann MACHINE COMPANY

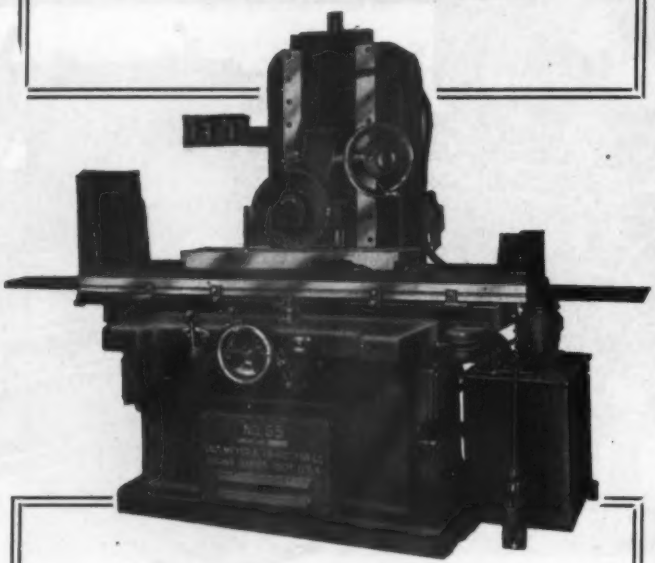
HOUTEAU AT GRAND ★ SAINT LOUIS (3) MISSOURI

GRAND RAPIDS

No. 55

Hydraulic Feed

SURFACE GRINDER



CAPACITY 12"x17"x36"

. . . for Toolroom or Production close tolerance grinding . . .

The No. 55 Grand Rapids is designed to assure high speed and accuracy. It has a table working surface of 12" x 36", an automatic longitudinal table travel of 38" and a traverse travel of 13½".

Features include the massive, sturdy "Grand Rapids" one-piece column and base, a construction which assures permanent alignment of cross travel and upright head ways. Saddle is a one-piece heavy rigid casting; spindle is mounted on preloaded ball bearings. Hydraulic feed assures smooth work.

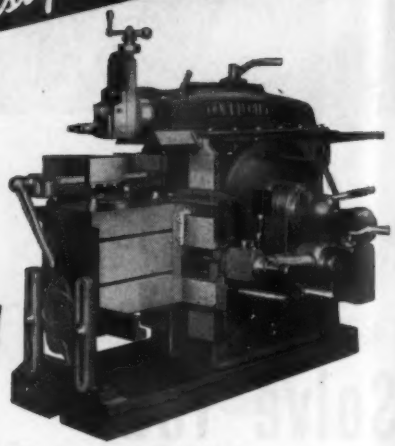
Ask for Bulletin GL-100 describing the full line of Grand Rapids Grinders of this type.

GALLMEYER & LIVINGSTON CO.

300 Straight Ave. S.W.

GRAND RAPIDS MICH.

A NEW ADVANCE IN SHAPER *Design and Efficiency*



The NEW 20" QUEEN CITY

Super Twenty Shaper

The new Super 20 Shaper is unequalled for versatility, output and accuracy — whether used for heavy production or tool and die work. Many improved operating conveniences enable the worker to handle a wide variety of jobs with remarkable ease. This massively constructed machine with its wide feed range, permits the handling of large, heavy pieces down to unusually small jobs. Shaping of complex fixtures and angular work is accomplished with minimum effort.

The ram is of the V-type of wide bearing, both bottom and sides. The clutch is the dry multiple-disc type, requiring minimum attention and adjustment. The feed range is extremely versatile — from .008" to .191". Changes of feed are quickly, easily accomplished. A high torque motor for the power rapid traverse is standard equipment, with many unusual features. An electrical limit switch is incorporated into the rail, offering complete motor control. Timken Bearings are used throughout.

For top performance and unusual economy both in first cost and upkeep, the Queen City "SUPER TWENTY" Shaper will meet with your entire satisfaction. For full details regarding features and specifications of this new Shaper, *write Dept. MM.*

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217 E. SECOND ST.

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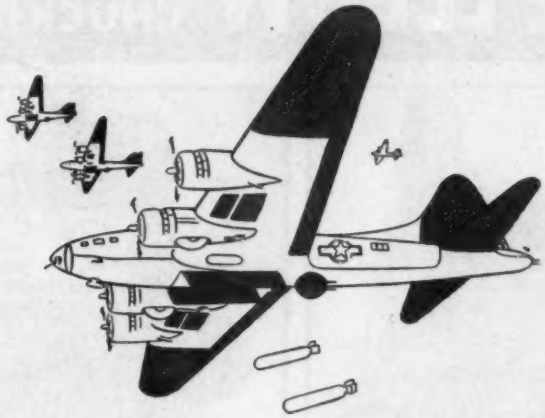


BRIGGS REPORTS

on One Billion Dollars in War Orders

—*and how the money is being spent*

During peacetime, Briggs Manufacturing Company is the Nation's largest independent automobile body manufacturer. In the war Briggs is devoting its peacetime skill to making bodies and parts for medium tanks and aircraft; also, bomber turrets, droppable gas tanks and non-ferrous castings.

Briggs war orders total approximately $1,000,000,000. This money has been spent or is being spent as indicated in the box shown herewith. Percentages are based on distribution of Briggs 1943 sales dollar.

53.6%	to about 40,000 employees for wages and salaries.
0.2%	for executive salaries.
32.1%	to some 2,000 subcontractors for materials, supplies and assemblies.
1.9%	to stockholders for dividends.
9.2%	for taxes.
1.2%	for depreciation.
1.2%	for reconversion expenses and other costs arising from the war.
0.6%	left in the business.

In 1943 Briggs did twice as large a dollar volume of business as it did in an average peacetime year. In 1943 Briggs delivered double the number of tank hulls delivered in 1942. In the same year Briggs delivered to the U. S. Army and Navy more than 22,500,000 pounds of airplane sections, as compared with 7,000,000 the year before. This included almost twice as many bomber fire-power turrets as in the previous year. Total shipments to date of airplane sections by Briggs exceed 45,000,000 pounds.

Earnings by Briggs hourly paid employees in 1943 averaged $3,159.00. On December 31, 1943 there were 39,312 people on the Briggs payroll, of which 21,737 were men and 17,575 women. This is 48% greater than on December 31, 1942 when Briggs payroll was 26,401 people.

In the first five months of 1944, shipments of airframe sections, by Briggs, were at considerably greater monthly rates than during any other months since the war began. Production of tank hulls was almost equal to the 1943 rate. Deliveries of auxiliary gas tanks, for the first five months of this year, were 7 times the total for 1943, and shipments of aircraft fire-power turrets were at a rate almost twice that of last year.

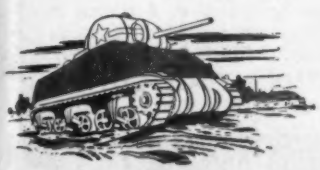
Unless very extraordinary developments take place, Briggs 1944 war business should be equal to, or exceed, its record 1943 year.

During the war, Briggs has shown that experience in manufacturing good automobile bodies, plumbing ware and non-ferrous castings has enabled it to turn out good "bodies for bombers, fighters, tanks" and other war requirements. Briggs is glad that it has been able to play an important part in the Nation's war effort. All of its facilities and energies will continue to be available to the Armed Forces until Victory has been won.

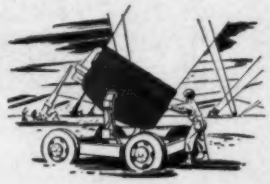
However, when Victory does come, Briggs is prepared to go about the job of reconversion with the same dispatch and intensity that it applied to the preparation for war, and, if it is allowed to do so, can go back into at least some peacetime production quickly.

W. O. BRIGGS
Chairman of the Board

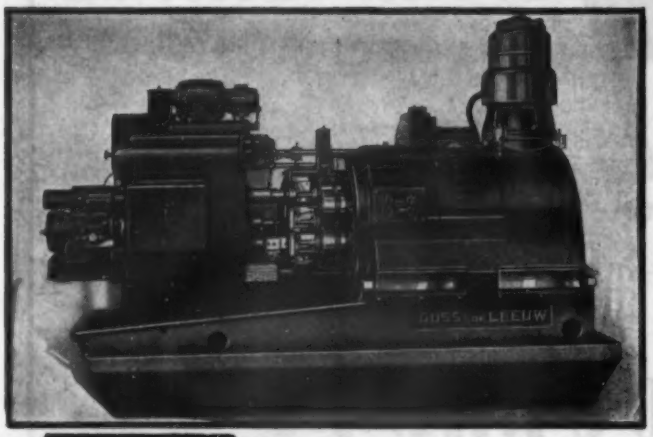
W. P. BROWN
President

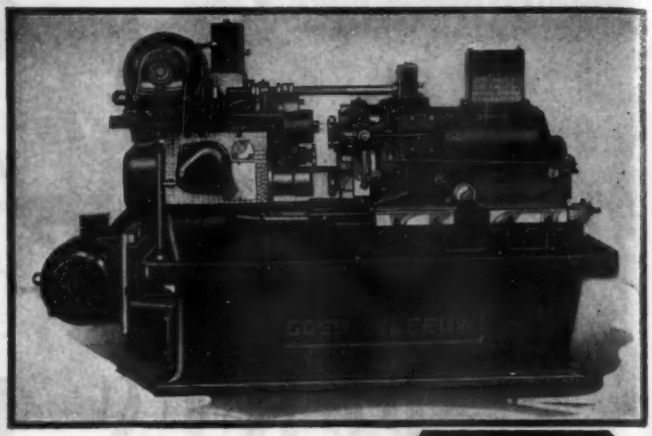


BRIGGS MANUFACTURING COMPANY
DETROIT



GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES





WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

Features include:

Lead Screw Threading on both types—Preloaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

No. IG INTERNAL GRINDER
No. 34 VERTICAL SPINDLE SURFACE GRINDER
No. 1½ HAND FEED SURFACE GRINDER
No. 3B AUTOMATIC FEED SURFACE GRINDER

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Horizontal Boring, Drilling and Milling Machine
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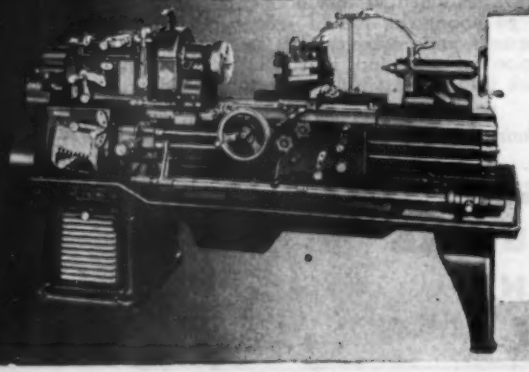

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Cincinnati Lathes are produced to handle heavy duty work with ease and precision. They are powerful, rugged, fast and convenient with every detail of design and construction developed to assure long-lived accuracy under full capacity operation. Available in sizes from 14" to 30", with 1 or 24 speeds and 32 to 96 feeds. Our latest catalog gives complete details. Write today for your copy.

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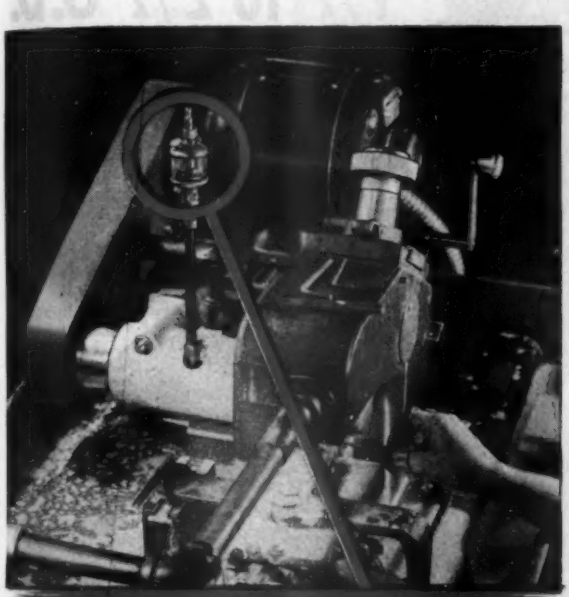
ON TWIST DRILLS
24 hrs. per day!

CONTINUOUS DUTY DEMONSTRATES UNUSUAL STAMINA OF DUMORE GRINDER!



SEE THAT OILER?

It is the only addition to the Standard No. 12 Dumore made necessary by this non-stop application! It is a time-saving convenience, in that it reduces the frequency of quill lubrication by the operator. And it is a protection for the tool in that it presents constantly visible evidence of the adequacy of the lubricant upon which the quill may draw.

A large plant devoted principally to producing twist drills has found Dumore Precision Grinders invaluable for many critical operations. The machine illustrated is one of a number specially designed and built for the purpose of grinding relief on the lands of twist drills. A Dumore No. 12 Grinder (1 hp.) is incorporated in the machine, which is provided with interchangeable die blocks to accommodate various sizes of drills.

With the demand for drills at an all-time peak, these machines were kept in operation 24 hours a day, for over 9 months. This is close to a record for any machine, and furnishes striking proof of the exceptional stamina built into all parts of the Dumore Grinder.

Read about the exclusive features of design and the extreme care used in manufacturing Dumore Precision Grinders; ask for Catalog 42. Write today!

The Dumore Company, Tool Division, Dept. TG14, Racine, Wisconsin.

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Low Cost Machining on 18" Bar Stock 1½" to 2½" O.D.

• Ample tooling space for variety of shoulder lengths and diameters. Ideal for motor armature and transmission shafts, spindles, gun parts and comparable work.

Cleveland makes the only complete line of full automatic machines with bar stock capacities from 9/16" to 10" . . . Also high-pressure hydraulic die-casting machines for magnesium, aluminum, bronze, brass or zinc. **Write for Cleveland bulletins on automatic or die-casting equipment.**

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WITH A *Hammond*

10" WET-N-DRI GRINDER

BETTER FINISHING, LOWER COSTS, ON JOBS LIKE THESE

Many jobs now being done on shapers, milling machines, surface grinders, disc grinders, etc., can be finished much faster and better by the Hammond Nu Way Machining. The Hammond 10" Abrasive Belt Grinder produces finishes often superior to older methods. It saves manhours on surfacing, grinding and polishing, deburring, definning, beveling, chamfering and other operations.

NOTE THESE FEATURES:

Wet-n-Dri operating takes belts up to 10" wide

Heavy duty — machine tool construction

Automatic belt tensioning device (patented) Plain or oscillating table available

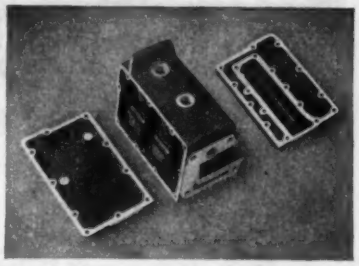
Oscillating table has micrometer adjustment

Adequate power capacity in 5, 7½ or 10 HP motors

HAMMOND ENGINEERED WORK-HOLDING FIXTURES

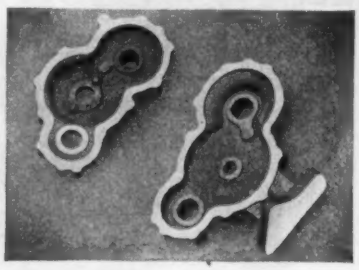
MODEL V-10 FOR ABRASIVE BELTS UP TO 10" WIDTH

Write Today for Bulletin 307.



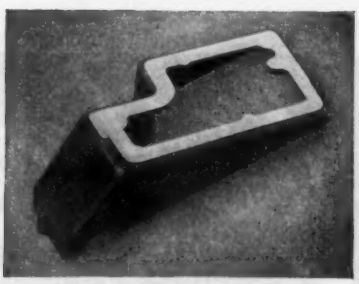
CYLINDER BLOCK

Four surfaces finished from rough (bottom, two sides and one end). Cylinder side covers, one surface finished from rough. Oscillating table and fixtures used on the V-10 to finish these parts.



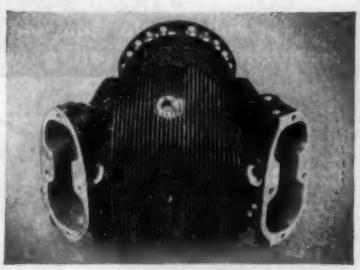
GEAR HOUSING

Gear Housings 13" long 6" wide finished in 25% of the time required for milling and hand lapping. No distortion caused from fixture clamping pressure when finished on the V-10.



ALUMINUM HOUSING

This part, because of thin side walls, distorted badly in milling machine fixture. Flat surface quickly and easily finished on V-10 with no distortion from fixture clamping pressure.



CYLINDER HEAD

Rockerbox surfaces (2) finished on the V-10. Special indexing fixture used to index from one surface to the other, thereby permitting finishing of both surfaces in one handling.

Hammond Machinery Builders INC.

KALAMAZOO 54F. MICHIGAN

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For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1600 RPM.
constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL
For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
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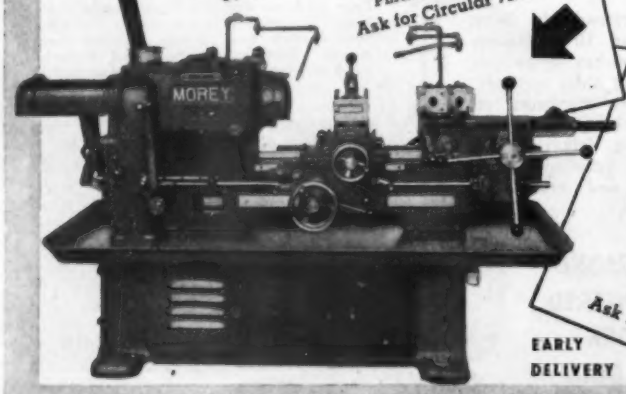
EARLY DELIVERY



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GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.

SPINDLE MOUNTED ON TIMKEN BEARINGS.

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THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

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CUTTER SHARPENER
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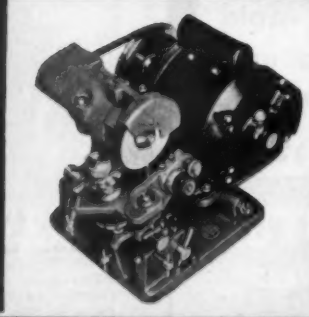
Send for Bulletin No. 344 which gives complete construction and operating details.

ECONOMICAL
FAST, ACCURATE
EASILY OPERATED



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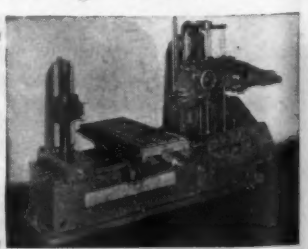
Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
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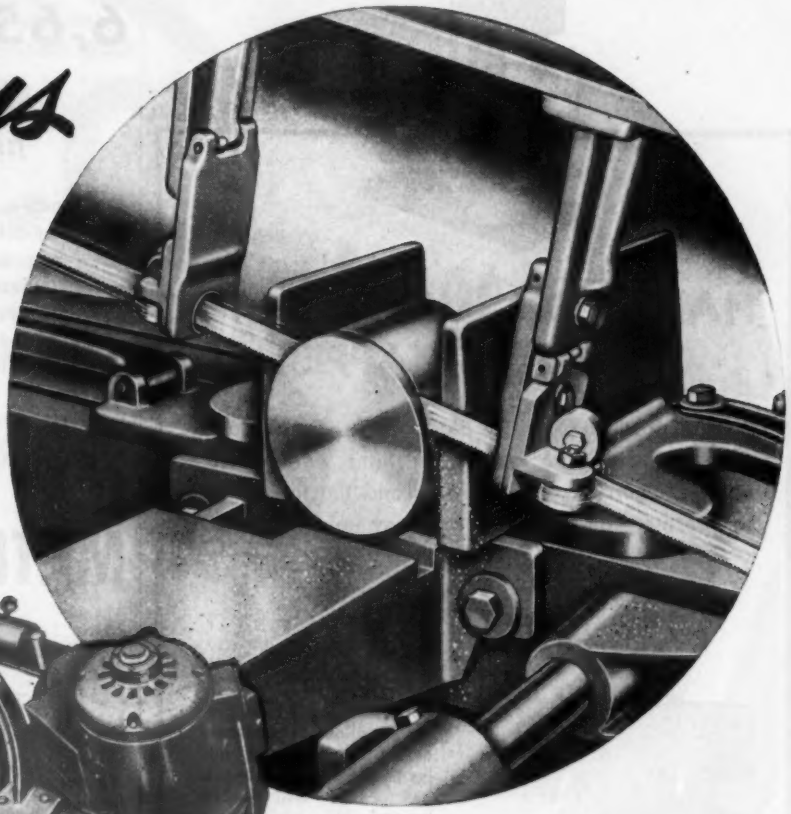
STEP UP PRODUCTION *with*

Continuous Cutting the WELLS WAY



An all-purpose metal-cutting saw, the Wells No. 8, can be used on production, in stores, toolrooms or on maintenance for dependable service in the cutting of metals.

Three-speed selection provides the most efficient cutting speed operation. Gravity controlled feed and automatic shut-off permit one person to keep 2 or more Wells Band Saws in operation.

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WELLS No. 8

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ROUNDS: . . . . 8" diameter
MOTOR: . . . . . 1/2 H.P. current optional
SPEEDS: . . . Selective 60, 90, 130 ft. per min.
WEIGHT: . . . . . Approximately 750 pounds

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METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
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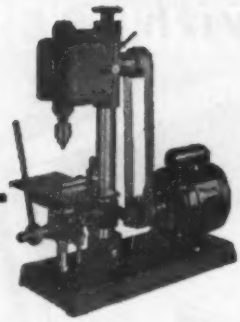

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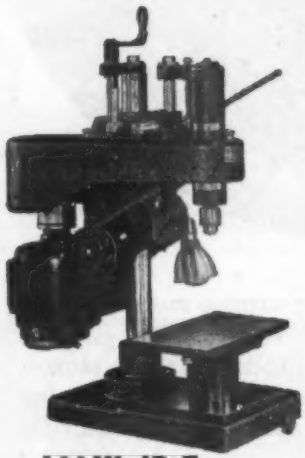
A high production sturdy little machine particularly suited to precision tapping of light work—instruments, cameras, watches, clocks and the like. Easy to operate—can be attached to any light socket.

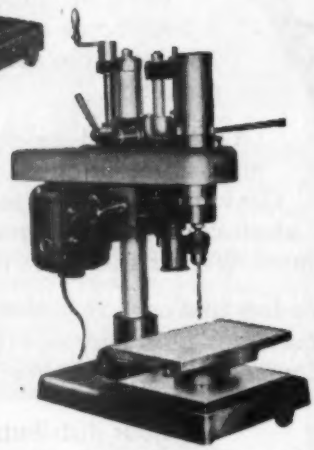


"VARIMATIC"

Built with instrument precision allows instantaneous variable speed adjustment in two ranges. Low range 840 — 270 R.P.M. High range 2900—9300 R.P.M. Drill capacity .004" to 5/16".

MAXI-JR-E

Designed and built for accurately drilling small holes .004" to .250" diameter. It consists of a self contained drilling unit which swings radially on the column and may be locked in any desired position. This extremely flexible small drilling machine may be ganged for sequence operations or to increase production. Spindle speeds from 750 to 21,000 R.P.M.



The "Varimatic" and the Maxi-Jr.-E each feature a full floating spindle of special design which eliminates radial belt pull on the spindle.

Write for full particulars on any or all of the machines shown.

The Hamilton Tool Co.

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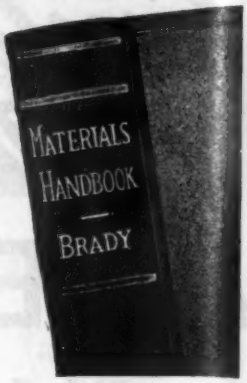

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He's a man without a last name . . . a fellow known to every American kid as "Uncle." He is everywhere in his great land—yet no one has ever seen him. He is the great spirit of America . . . calm, quiet, peaceful and kindly until he gets his "dander" up—then he is determined, strong and his wrath is relentless.

His is the spirit of sacrifice, toil and patriotism. He has weathered many wars, trials and tribulations—yet he is indomitable. He stood with Washington at Valley Forge . . . Perry at Lake Erie . . . Lincoln at Gettysburg . . . Pershing at the Marne . . . MacArthur at Bataan. He stands with every American to defend America.

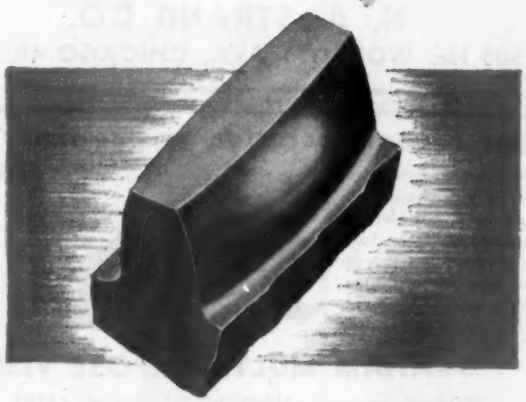
Today, he stands with you . . . urging you to do more and more in the cause of Victory. To buy more War Bonds—to contribute to the blood bank—to stamp out Black Markets—to defeat inflation—to be untiring in your efforts to hasten the day when our enemies will fall before our might. Ask yourself squarely if you couldn't be doing *more* to aid this great spirit—then *do* it.

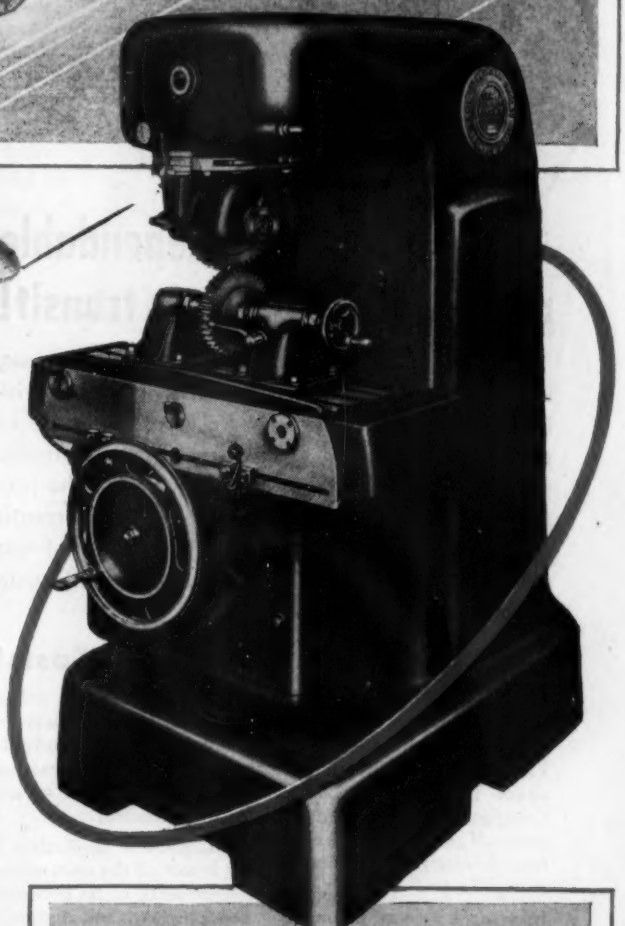
Let's keep this *greatest* American legend . . . *GREAT!*

APEX

THE APEX MACHINE AND TOOL COMPANY • DAYTON 2, OHIO

SHAVING
Replaces GRINDING
FOR AIRCRAFT ENGINE GEARS





A large motor company manufacturing the Pratt & Whitney Aircraft Engine has turned to gear shaving, according to a recently published article in American Machinist, for several reasons:

1. They find the quality of the shaved gear is equal or superior to the ground gear.

2. There are no burnt teeth such as may occur with grinding.

3. Shaved gears have a better final finish.

4. Dimensional tolerances can be closely maintained.

5. A gear which requires 40 minutes to grind can be shaved in 5 minutes.

Red Ring Rotary Gear Shaving corrects cutting errors of index, helical angle, tooth profile, eccentricity, and undesirable tooth roughness of gears from ¼" to 96" P.D. On these machines the teeth of gears from ⅜" to 36" P.D. can be shaved to the ELLIPTOID form (crowned) to eliminate "end bearing."

WRITE FOR DESCRIPTIVE FOLDER ON RED RING GEAR SHAVING

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

5600 ST. JEAN • DETROIT 13, MICH.

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

. . . the dependable protection for goods in transit!

IN STEAMING JUNGLE and frigid arctic areas, war supplies protected by FIBREEN are arriving in usable condition despite direct exposure to the elements. The weatherproof, tear-resistant, scuff-proof qualities that made FIBREEN the preferred protection for peacetime goods in transit are the very reasons why it is now an essential war need. When victory is won, FIBREEN will again be available for general use.

Cut Your Postwar Shipping Costs!

Shipping and handling costs in many industries have been reduced by the use of FIBREEN. For nearly 25 years The SISALKRAFT Company has pioneered in methods of using fibre-reenforced, waterproof wrapping materials.

In your postwar planning you may benefit from our long experience in the uses of FIBREEN and other SISALKRAFT products — to protect your products from damage in transit — to cut costs — to reduce losses in transit!

SISALKRAFT leadership is the result of the unmatched performance of its products and a research and engineering service for developing better wrapping methods.

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205 W. WACKER DRIVE · CHICAGO 6, ILL.
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Ask SISALKRAFT *to help cut your wrapping and shipping costs!*

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Used Throughout the Nation

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⅛ to 3 H.P.

Attachments for Hundreds of Operations

Rotary Files
Ground Cutters

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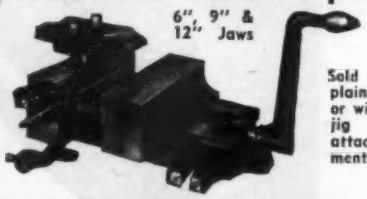
For repeat-operation or one-time jobs

For straight holding, or as a widely adaptable jig or fixture for innumerable special holding jobs, this Vise leads a busy life on miller, drill press, planer, radial, shaper, grinder, etc.



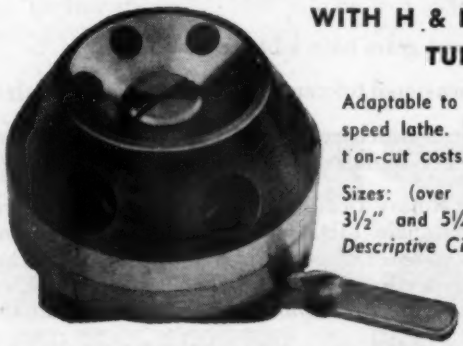
GRAHAM MULTI-PURPOSE VISE

KNURL HOLDER FITTING LATHE TURRET
This Adjust-angle Holder cuts numerous patterns using only straight knurls. Handles work up to 2½" dia. Shank made to fit your turret.

Request Illustrated Price Circulars

GRAHAM MFG. CO., 85 BRIDGE STREET EAST GREENWICH, R. I.

MAKE YOUR LATHES MORE PRODUCTIVE WITH H & H 6 TOOL TURRETS



Adaptable to any engine or speed lathe. Speed production-cut costs.

Sizes: (over all dia.) 3", 3½" and 5¼". *Write for Descriptive Circular.*

H. & H. MACHINE TOOL CO., Waltham, Mass.

GEARGRIND PERFORMS TWO OPERATIONS AT ONCE ...

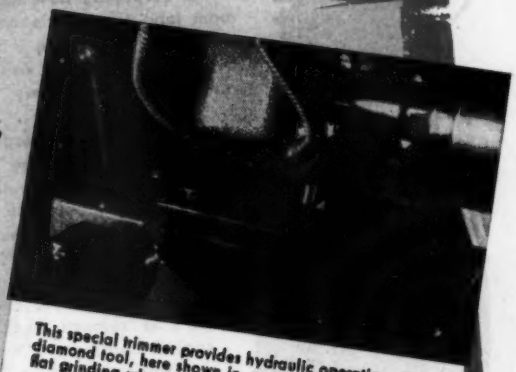
Finish Grinding Time Cut in Half

In grinding an overrunning clutch for an aircraft supercharger part, one GEARGRIND Machine, equipped with dual grinding wheels and a special trimmer, grinds both flat and radius at the same time.

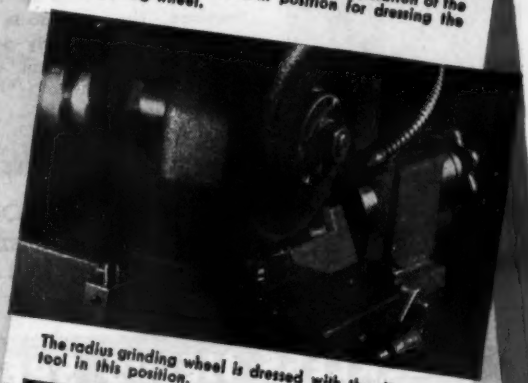
Originally these two operations were performed separately, involving either break-down and set-up when both were performed on the same machine, or the use of two machines on a production basis.

GEARGRIND engineers developed the dual wheel trimmer, while continuing the conventional GEARGRIND method of wheel dressing, using the extended stroke of the table as wheel dressing is required.

Similar methods may fit into your program, where production, finish and accuracy are vital factors. We shall be glad to discuss the possibilities with you.

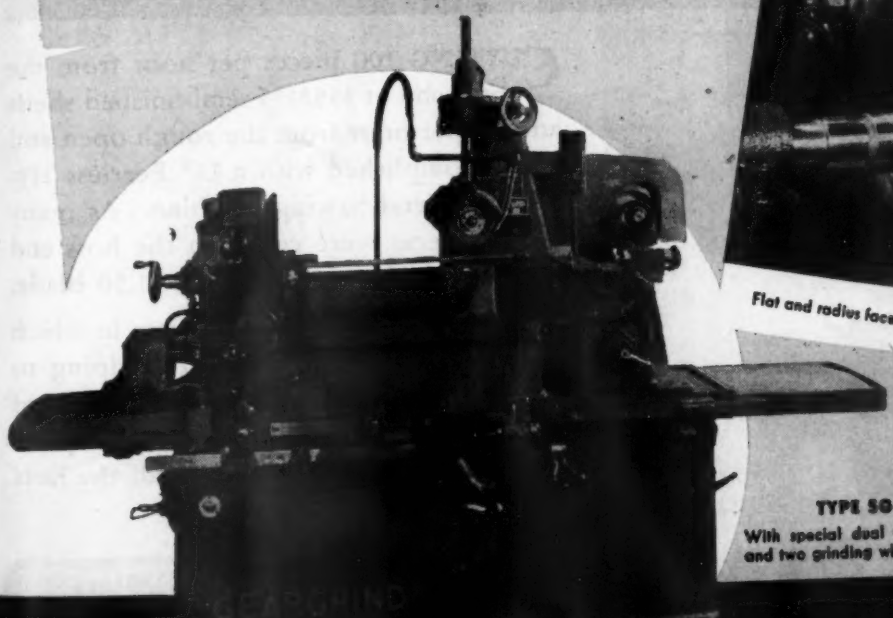


This special trimmer provides hydraulic operation of the diamond tool, here shown in position for dressing the flat grinding wheel.



The radius grinding wheel is dressed with the diamond tool in this position.

Flat and radius faces are both ground at the same time.



TYPE SG-11
With special dual wheel trimmer and two grinding wheels.

ARMY E NAVY

The GEAR GRINDING MACHINE COMPANY
DETROIT 11, MICH. U.S.A.

"THE HANDIEST MACHINE *in the shop," you'll say*

We can't quote *all* users of LINLEY machines but from what we've heard the expression "the handiest machine in the shop" may well prove to be *your* opinion when you install one.

It is surprising how many small toolroom jobs can be cleaned up in short order . . . fussy little jobs that do not warrant the use of expensive higher rated machines. Every toolroom has them continuously . . . dies, jigs, models, metal pattern, boring, milling, drilling, reaming . . . but they will not clog the shop when a LINLEY can dispose of them so easily . . . so accurately.

There are 8 speeds from 275 to 4250 r.p.m.; direct micrometer setting; "velvet" feed; counterbalanced quill to remove backlash; grease-sealed bearings; 7" x 17½" table size and only 18½" x 20" floor space required. The machine is extremely well built and properly designed to do precision work on continuous schedules. Changeover from one type of work to another is simple and fast.

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Famous Gold Seal Spindle
Electrically-Operated Diamond Wheel Dresser

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ELECTRO-HYDRAULIC INTERNAL GRINDER

Ready ahead of time—the Sav-Way MH-1 combination hand and electro-hydraulic internal grinder. 5/32" minimum table stroke! Gatling gun table speed through the use of aircraft-type micro-limit switches and solenoid-operated valves. Electrical, automatic, adjustable cross feed. Dozens of outstanding features! It's a post-war machine—ready now to help speed today's war production! Its low cost will surprise you.

Send for Illustrated Literature

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Machine Tool Division

Sav-Way Industries, Box 117, Harper Station, Detroit 13, Mich.

PEERLESS HELPS SPEED 155MM SHELL PRODUCTION

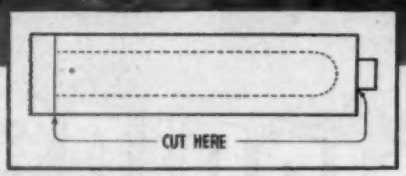

Diagram indicates nose and heel cutting operations on 155 MM shell forgings. Sawing relieves the load on lathes, milling machines and other higher priced tools.

CUTTING 100 pieces per hour from the boss end of 155MM semi-finished shells and 20 per hour from the rough open end was accomplished with a 14" Peerless Hydra-Cut Metal Sawing Machine. As many as 800 pieces were cut from the boss end with one high-speed, 4-tooth, $1.50 blade.

That's just one of many ways in which Peerless Hydra-Cut Saws are helping to win the war. And, Peerless has a story of solid interest to you in your postwar planning. The coupon will bring all the facts without cost to you.

Builders of Fine Tools for Thirty Years—Acro-Matic Grinders Hydraulic Pumps . . . Blades . . . Coolant . . . Special Machinery

PEERLESS MACHINE COMPANY
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Ready for a Tough Assignment

THAT LOOKS EASY

THE hole is drilled—the tough metal has been removed at lowest cost with a Red Shield Brand Drill. The Reamer's task is but to size it to the correct dimension, and leave a mirror smooth finish to provide a perfect fit for the connecting member. It looks easy.

To attain perfection is never easy. This is the assignment for which each Shield Brand Reamer is designed, constructed, finished, heat treated, tempered, inspected, tested, and finally carefully packed to protect its cutting edges until it reaches you.

The best evidence that Shield Brand Reamers meet this assignment 100% is the fact that they are specified, preferred and used in ever increasing numbers by America's mass production industries where the interchangeability of parts requires perfection in dimension at each manufacturing step. We welcome your inquiry.

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STANDARDIZE
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TO attain uniformity of production, of operation, and reduced costs, specify Standard Shield Brand Metal Cutting Tools.

You get:

Uniformity of quality in all your metal cutting tools.

Uniformity of performance for each metal cutting operation.

Thus assuring like standards of operation for all metal cutting operations in all departments in your plant, and attaining greater manufacturing economy.

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Put One of These New POPE **SPINDLES** *With General Electric Motor* **SEALED IN** *on a 6" x 18" Surface Grinder*

AND SEE WHAT HAPPENS!

You'll save time and do better work. This Spindle with its specially designed General Electric motor sealed in and larger SKF double row roller bearings has what it takes to rough off surplus metal fast when that's what you want.

It produces a finer finish because of these same features plus massive construction and closer manufacturing tolerances.

You'll save money and bother, too. This spindle never lets you down. It always operates at peak efficiency for the motor is sealed in and so is the Spindle lubricant. No operator attention is required. A few swipes of a cloth on the smooth sealed motor housing is all the maintenance it ever needs.

Try this new Sealed-Motor Spindle. See what the operator says. Check the results in terms of quantity of output and quality of finish. After that we won't have to sell you on the idea that this new POPE Motorized Spindle with the dirt sealed out and the quality sealed in will improve your product and increase your profits.

Features of this new POPE Sealed Motor, Sealed Lubrication Spindle include:

A —**A new specially designed G-E Motor.**

B —**Extra large SKF Super-Precision Double-Row roller bearings.**

C —**Extra heavy shaft.**

D —**Closer manufacturing tolerances.**

These and other features result in finer finishes. And, remember, these qualities are sealed in for good and all.

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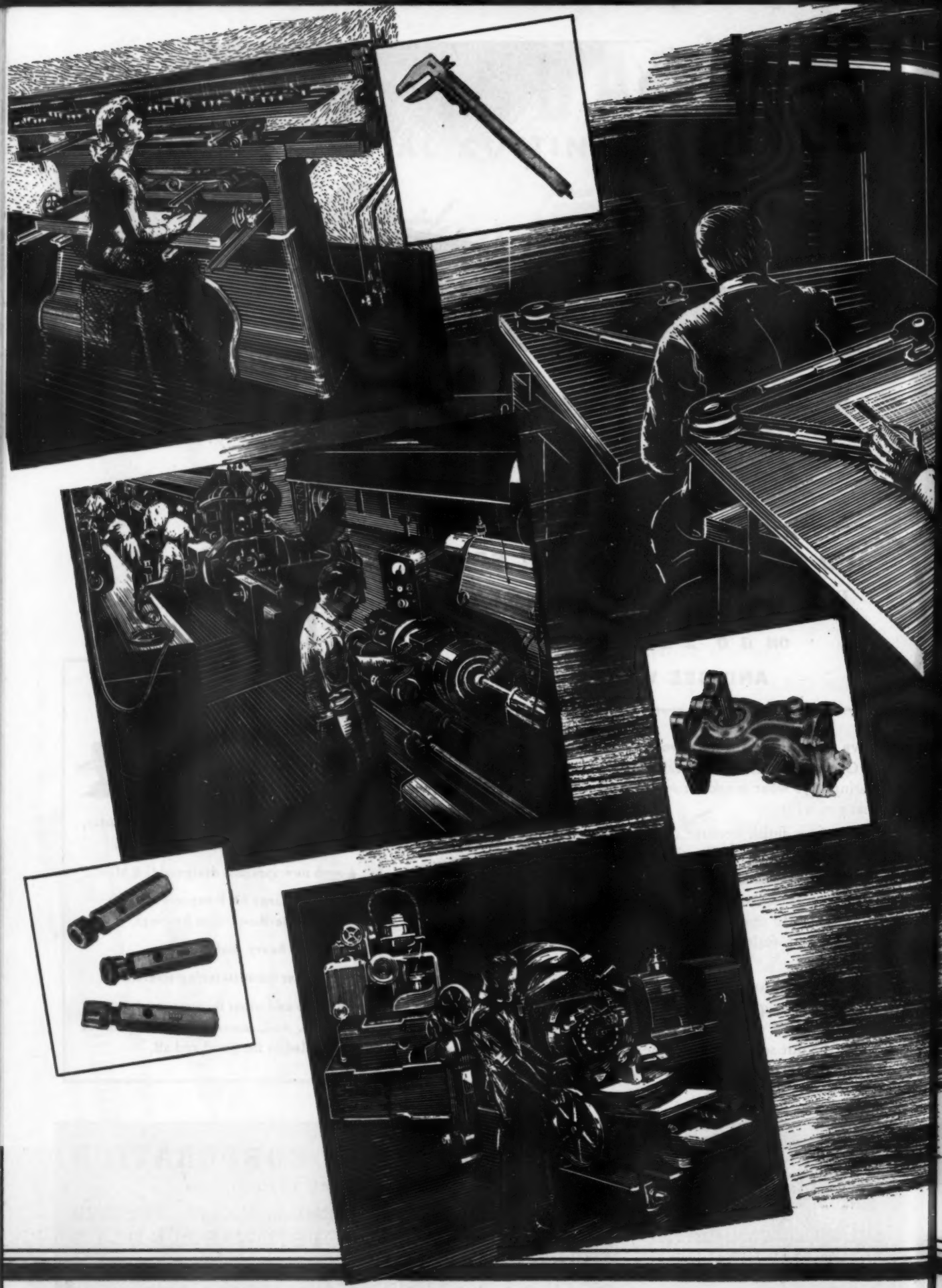
BUILDERS OF PRECISION SPINDLES



VARD DEPARTMENTS: Engineering & Drafting • Product Development • Drilling & Honing • Heat Treating • Plating & Anodizing
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1,700,000 new Californians alone offer a whale of an increased market for that new product of yours. Perhaps you are searching for better methods of reaching this fast growing territory. Perhaps it would help to have your product finished right here on the Pacific Coast. VARD Inc. can help with your sub-assemblies or we can produce the complete work for you.

You might be surprised to know that in one plant we offer a foundry with heat-treating and testing departments, supported by a complete pattern shop. . . Extensive machine shops with highly trained machinists to turn out a variety of intricate hydraulic and other actuating devices, gears, clutches and navigation instruments. . . Inspection and assembly departments, with full hydraulic testing equipment to complement the manufacturing shops.

It might also be of great importance to you in the speeding of your production to know that our facilities include large optical and gage making departments. In temperature controlled rooms, we produce various types of thread, cylindrical and other gauges. Our skilled glass workers grind and polish lenses and prisms for gun sights, observation instruments and complete optical systems. To reduce reflections and increase light transmission, glass is Opticote treated. We engine-divide, engrave and calibrate protractors, dials, scales and calipers. We do our own painting, plating and anodyzing.

VARD has the ability, equipment and plant to develop and produce not only fine precision products but also the capacity to produce them in required quantity. We invite your inquiry.

ARMY E NAVY

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HOW TO GET THE MOST PRACTICAL SOLUTION TO YOUR MILLING PRODUCTION REQUIREMENTS...

Whatever Your Milling Problem is, Sundstrand Engineers can Solve it Effectively... Using the Most Simple and Economical of these

three methods...

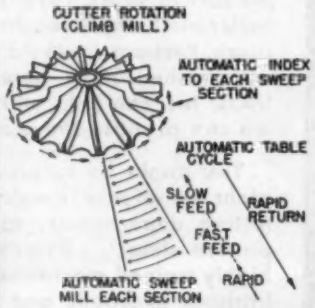
1 Standard Rigidmils with Fixtures and Tooling to Suit Your Work

Sweep Milling Between Impeller Vanes

Part—Supercharger impeller.

Operation—Sweep milling surfaces between vanes, and indexing from section to section.

Machine—Sundstrand Model 33 *Standard* Fluid-Screw Rigidmil provides complete automatic cycle for a highly complicated milling operation as follows: (1) *Automatic cycle* is standard machine feature. (2) *Automatic Index* is provided by a standard attachment. (3) *Automatic sweep cycle* is built into the special fixture.



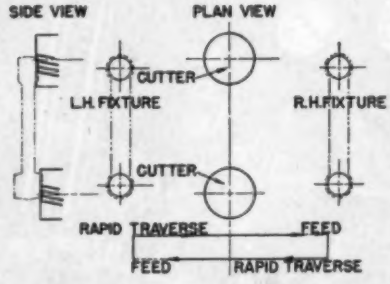
2 Standard Rigidmils with Special Heads and Tooling

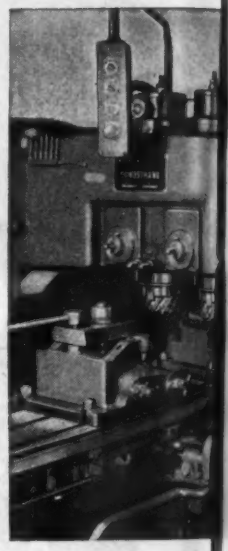
Face Milling Two Separated Surfaces

Part—Connecting rod.

Operation—Mill two surfaces simultaneously.

Machine—Sundstrand Model 33 *Standard* Fluid-Screw Rigidmil equipped with a *special 2-spindle vertical head* mills both faces. Standard two-way table cycle and two fixtures eliminate loading time.





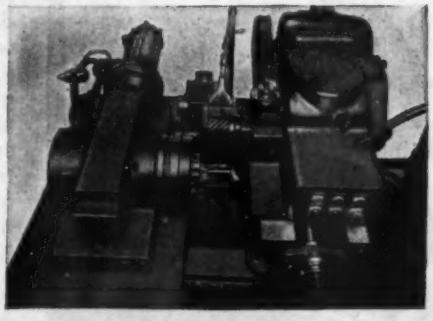
3 Entirely Special Milling Machines to Suit Specific Jobs

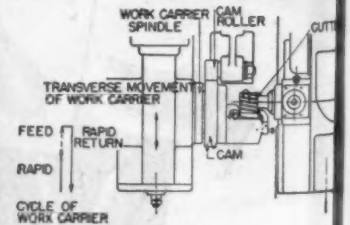
"Turn-over Mill" for Turbine Blades

Part—Stainless steel turbine blade.

Operation—Milling curved surface on back of blades.

Machine—*Special* Sundstrand Hydraulic Rigidmil has adjustable milling head and opposing work-holding spindle mounted on two sets of ways. Fixture feeds to correct depth, then revolves through approximately 265° to mill curved surface on back of blade part.





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These free booklets cover the entire range of standard Sundstrand Milling Machines. Write for them today —ask for Bulletins 126.

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PRECISION MEASURING INSTRUMENTS

the BIG 8 are back
These Versatile TOOL STEELS... with original prewar analyses... are again available for your tool and die jobs

For many months, Bethlehem has been unable to supply certain standard brands of tool steel for general distribution. *But this is no longer true of eight very popular grades—eight types that will handle 97 per cent of your jobs requiring tool steel.*

And here's more news: These highly-versatile tool steels are back on *prewar compositions;* they are not substitute analyses. For this reason, they can be relied upon to do the same dependable job that they were doing in thousands of shops before war-time shortages.

The Big 8 Bethlehem Tool Steels, once more available to shop men generally, are as follows:

- **CARBON TOOL STEEL**
- **TOOL ROOM**
- **OMEGA**
- **NO. 67 CHISEL**
- **AIR-HARDENING**
- **LEHIGH DIE AND TOOL, H TEMPER**
- **NO. 57 HOT WORK**
- **NO. 66 HIGH SPEED**

If these eight steels are old friends of yours, you can now get acquainted with them all over again. If you haven't used them before, why not let us tell you about their applications and advantages?

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

Bethlehem Steel Export Corporation
New York City

★ BETHLEHEM STEEL ★

your saws are cutting everything from bamboo poles to bricks

"Out here in India," writes an Army Lieutenant, "Disston saws are doing their part to slap the Japs. *You would shudder at the uses and abuses to which your saws are put.* One of our bearers, a native lad, has been doing yeoman service on everything—bamboo poles, rubber hose and red bricks."

Yes, the army needs toughness in tools as well as in men. Perhaps that's why so many Disston saws are found with the armed forces—from Greenland to India. Ski troopers use lightweight Mountain Buck Saws, specially developed for them by Disston. On other battlefronts, Disston Power-Driven Chain Saws are clearing the way through woods or jungle for tanks, trucks and guns. And wherever you go, you'll find Disston hand saws, circular saws, files and hack saw blades close behind the lines.

Disston has produced many special tools for war industries, too. For example—Powder Heads used in making gun powder; Valve Plates for the scavenger pumps of tankers; a specially-shaped file for use on Stainless Steel blades of turbines for destroyers.

The skill, the steel, the experience and engineering that helped solve these problems are vital ingredients of Disston *standard* tools. So when you need wood or metal cutting saws, files, hack saw blades, tool bits or machine knives, depend on Disston for tools that cut costs as well as they cut materials.

For information, write Henry Disston & Sons, Inc., 720 Tacony, Philadelphia 35, Pa., U. S. A.

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A Tool that tells a story

This heavy duty *inserted blade* boring, chamfering and facing tool was designed and custom built to solve a specific, high production metal cutting problem. Rugged simplicity and interchangeable cutter heads and blades are combined.

It is used here as a symbol because it is typical of the work Gairing engineers and craftsmen are doing in the design and precision manufacture of inserted blade cutters.

More than a quarter century of specialized experience in creating tools of this character has naturally taught us the particular advantages of all types of Gairing inserted blades and locks. We use all of them: the type best suited for the need.

Should you have a production job requiring the use of Inserted Blade Cutters, we'd like to discuss the matter with you • The Gairing Tool Company, Detroit 32, Michigan—Manufacturers of standard, special and Gair-Lock inserted blade cutting tools.

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Stand the gaff of toughest threading demands . . . . . .

CARD DIES ARE AVAILABLE THROUGH LEADING DEALERS

Under today's conditions, when quality must be maintained regardless of quantity demands, it is good to know that CARD DIES can be depended on for production threading.

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In addition CARD manufactures Hexagon Rethreading Dies, Solid Square Pipe Dies and Bolt Dies.

Consult the Card Catalog for your requirements. Send for your copy today.

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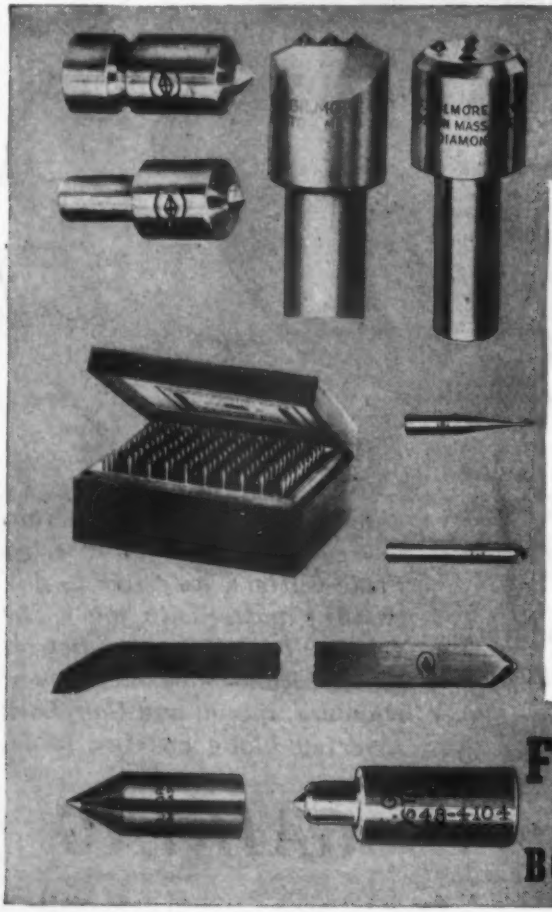


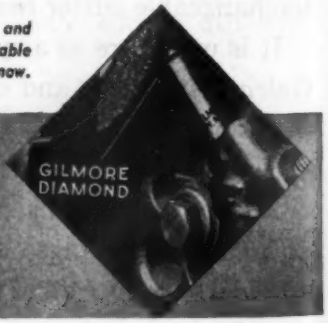
GILMORE DIAMOND TOOLS

Meet today's exacting requirements for truing precision grinding wheels

Gilmore facilities include not only an adequate supply of rough diamonds but also a complete, fully equipped modern plant for tool making and diamond cutting. Careful selection of diamonds combined with long experience in mounting diamonds for highly specialized wheel truing use, enable Gilmore to render an invaluable complete service to the metal working industry.

Gilmore Diamond Tools include mountings for hand and machine wheel truing, needle point diamond tools for use on wheels used in grinding taps, threads, gages, small contours, etc. and tools for truing specially formed grinding wheels.

Complete information on the Gilmore line and service is contained in illustrated folder available promptly on request. Send for your copy now.



F. F. GILMORE & CO.
285 Columbus Ave.
BOSTON, MASS.

MISTER, if these are YOUR questions—

How many pieces will cut-off tool deliver before it needs resharpening?

What is cost of each cutting-off operation?

What is cost of preparing blade for cut-off operations?
(to make a new blade or alter another one in your own shop)

What is cost of replacing setup after resharpening?

Can resetting be done by anyone but skilled operator?

Then HERE is the cut-off blade to know about!

TODAY, ACCEPTED IN LEADING PLANTS FOR ITS REMARKABLE PERFORMANCE—ECONOMIES, SPEED AND QUALITY PRODUCTION.

READY TO USE! PROVIDED WITH ACCURATE MACHINE GROUND CLEARANCES WHICH ELIMINATE EXCESSIVE FRICTION—SPEED PRODUCTION—SIMPLIFY OPERATIONS—REDUCE BREAKDOWNS AND DOWNTIME

Why be bothered making a cut-off tool today when one can be supplied to you ready to be put on your machine? Once set for specific job it requires very little attention during operations. Your skilled operators can thus be relieved to do more essential tasks. Even when resharpening is required the blade can be removed from holder and replaced with precision accuracy without necessitating skilled hands. The scientific T-shape design causes all excessive friction to be eliminated; thereby extending blade life, increasing production, reducing breakdowns, achieving higher quality results.

This remarkable blade is Empire Tool Company's Luers Patented Cutting-off Blade. It is available both parallel and tapered on longitudinal cutting width. And just recently the same features were offered in a Cobalt Blade designed for the real tough jobs.

Also manufacturers of Empire Floating Tool Holders and distributors of Fastcut Centerdrills and Keyseat Cutters

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BUY WAR BONDS

EMPIRE TOOL COMPANY MANUFACTURERS LUERS PATENTED CUTTING-OFF BLADES AND HOLDERS UNDER LICENSE ISSUED BY JOHN MILTON LUERS PATENTS, INC.

The Blades That Reduce Friction

EMPIRE Tool Co.

8778 Grinnell Ave.
Detroit 13, Mich.

The Book of the YEAR!

VICTORY SCREW THREAD
DATA BOOK
with
Foreign and Domestic
THREAD SYSTEMS

CONTENTS

Definitions * Thread Series * Fits (Description) * Marking Symbols * Stockable Chaser Sizes * Coarse Thread Series—Basic Dimensions * Proposed National Extra Fine Thread Series * 27 Pitch Lighting Fixture and Brass Tubing Threads * Fine Thread Series—Basic Dimensions * Tolerances for Screws and Nuts Class 2 and 3 * 8, 12 and 16 Pitch Series * Class 2 Tolerances for Coarse and Fine Thread Series for Screws and Tapped Holes * Tap Drill Sizes for National Coarse and Fine Threads * American National Pipe Threads—Straight Pipe Threads * Acme Threads * Stub Acme * SAE Fuel, Oil and Tube Fitting Thread * Stub 60 Thread * Spark Plug Thread Sizes. British Standard Whitworth * British Standard Fine Thread * British Association Thread * Cycle Engineers Institute Thread * British Standard Pipe—Taper and Straight * International Metric Thread * French Standard Metric Thread * French Standard Thread * Lowenhers Thread—Decimal Inch Equivalent of Millimeters * Equivalent of Metric Pitches in Inches and Threads Per Inch * Three Wire System of Measuring Threads* Decimal Equivalents * Single and Double Depths of American National Whitworth and V Threads Compared * Cutting Speeds—Surface Feet * Weight of Bar Stock Per Foot * Guide for the Design and Purchase of Screw Machine Products * SAE Steels (Analysis) * Important Suggestions on the Design of Threaded Parts.

FREE to Factory Executives
who request it on a business letterhead;
others, 15 cents

H&G DIE HEAD

The Eastern Machine Screw Corp.
Manufacturers of H & G Die Heads
20-40 Barclay St. New Haven, Conn.

YOUR *low-cost* WAY TO TOOL UP FOR No. 0 TO 1" TAPPING

Ettco-Emrick TAPPING ATTACHMENTS

With these comparatively inexpensive Attachments for your drill presses, you are set to handle any tapping in the range of No. 0 to 1" taps at the highest practical tapping speeds, and with all the accuracy and sensitivity any tapping job requires.

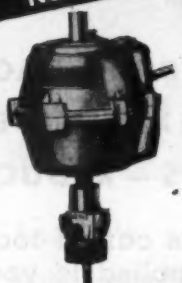
For full details about these Attachments, which have been in successful use throughout American industry for over 20 years, write today for BULLETIN No. 2.

FOR SMALL TAPS No. 0 to No. 10

ATTACHMENTS No. 100 No. 200

These two sizes have all parts operating in a pumped oil bath, assuring continuous smooth-running and sensitivity at high speeds so vital with small taps. Asbestos-carbon Cone Clutch—an Ettco-Emrick patented material—gives highly sensitive action and long wear.

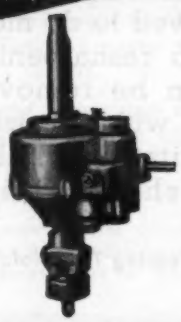
FOR MEDIUM TAPS No. 5 to 1/2"



ATTACHMENTS No. 1-B No. 2-B

An improved tapper, providing higher speed and longer life. Its leather cone clutch is unequalled for sensitive action and wearing properties. Clutch design includes provision for expansion and contraction. A long clutch life is common for these tappers.

FOR LARGE TAPS 1/4" to 1"



ATTACHMENTS No. 3-B No. 4 No. 5

The No. 3-B is designed specially for heavy tapping on light presses. It is geared so that the tap runs at one-third the speed of the drill press spindle. This has the effect of adding back gears to a small drill press. Nos. 4 and 5 are built around a floating amplified pressure multiple disc clutch and a shockless positive reversing clutch. All three sizes have the sensitivity of the smaller tappers.

ETTCO TOOL CO.
590 Johnson Ave., Brooklyn 6, N. Y.
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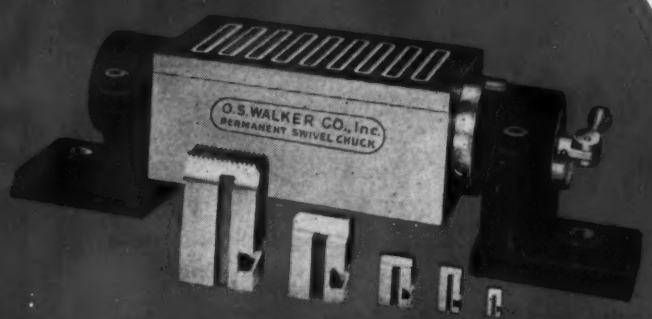
Over 25 years specialization in designing and building drilling and tapping equipment.

The New Line of WALKER PERMANENT MAGNETIC CHUCKS

PLAIN TYPE WALKER PERMANENT MAGNETIC CHUCK.



SWIVEL TYPE WALKER MAGNETIC CHUCK with graduated dial, providing accurate setting at any angle up to 180°.

. . . permanently greater in holding power . . . . . and available for immediate delivery in several sizes

This new line of chucks rounds out Walker's specialized service to the metal working industry as pioneers builders of magnetic chucks. Thus Walker is now prepared to meet demands for both Electro Magnetic as well as Permanent Magnetic Chucks.

WALKER PERMANENT MAGNETIC CHUCKS — in PLAIN and SWIVEL TYPES — of WALKER high standard quality — are the result of over fifty years experience in the development and design of this class of equipment and can be depended on to retain their holding power indefinitely. A larger magnetic area is provided through a spacing of only 3/8 inches between pole divisions. Furthermore the top plate area is totally magnetic. These features contribute to the more than 35% greater holding power assured with these new WALKER CHUCKS.

PLAIN TYPE WALKER PERMANENT MAGNETIC CHUCKS are available in a number of standard sizes for immediate delivery. Adaptations for special applications can also be furnished promptly.

The new SWIVEL TYPE CHUCKS are available in 3 sizes: 4"x8", 6"x18"; and 8"x24".

Write today for Descriptive Circular.

Send for literature giving complete details.

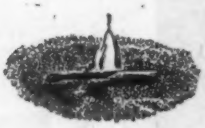
O. S. WALKER CO., Inc. Worcester, Mass., U. S. A.

Fidelity ABSORBO
OIL AND GREASE ABSORBENT AND FLOOR CLEANER

"OIL-DRIPS" *Sabotage* Your MANPOWER

Make floors *footsure* with Fidelity Absorbo

48,600,000 DAYS WASTED *BY FALLS!*



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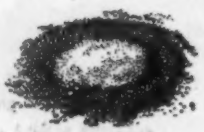

ABSORBENT

NON-ABRASIVE

SWEEPS CLEAN

It is estimated that 270,000,000 man-days are lost each year because of occupational injuries, 18% being due to *falls.*

Accidents due to slipping on oil-soaked floors, or the skidding of a truck, can be prevented. Fidelity Absorbo scattered over oily or greasy floors provides safe, sure footing. Recurring oil spills need not be swept up repeatedly, as Absorbo will retain oil or grease up to 50% of its own weight.

Today's manpower problems require even greater vigilance in safe floor maintenance. Fidelity Absorbo gives you this protection *economically.* A little goes a long way and it can be used until thoroughly oil soaked.

Send for a trial 50-lb. bag at $2.75 F.O.B., Newark, with unconditional money-back guarantee if not satisfactory. Substantially reduced prices on quantity orders. (Territories are open for local distributors. Write for details.)

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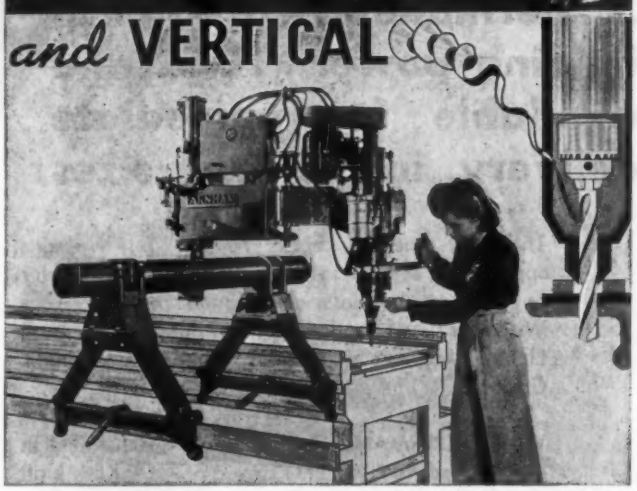
FARNHAM CARRIAGE DRILLS

for Speedy... Accurate Drilling of Spars, Wing Panels, etc.



USED ON STRAIGHT OR CURVED SURFACES

Ready for Installation on Existing Fixtures

FARNHAM MANUFACTURING CO.

1624 SENECA STREET, BUFFALO 10, NEW YORK

How To Keep Surface Grinding "Out of the Red"

When production costs call for segmental surfacing, you can get more for your money by insisting on Bay State's Blue Flash Segments.

Here's why. To the several natural advantages over solid ring wheels such as more usable abrasive, faster stock removal, increased wheel life—Bay State adds this extra plus:

FRACTIONAL GRADING...three degrees of hardness in each grade instead of the usual one

This extra margin of choice enables you to "fit the grade to the grind" for the fastest, coolest cutting . . . assuring that perfect balance between abrasive and labor costs that can mean the difference between being "in the red" or making a profit on the operation.

Don't forget Bay State's KOOLPORE processed segments—very open and porous—also offer advantages for surfacing operations.

As in segments, so in its entire range of bonded abrasive products, Bay State leads in offering extras . . . the extra know-how that goes into the finest honing and superfinishing stones ever made... the extra care that shapes, trues, and sizes mounted wheels and points on lathes *after* mounting on the spindles instead of pressing them to shape before mounting.

Such extras in manufacturing are the reflection of the engineering skill that goes "all out" to help you get the most from grinding.

Literature about Bay State Segments is yours for the asking.

BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.

BLUE FLASH GRINDING WHEELS *FAST and COOL*

HONING AND SUPERFINISHING STONES · CUT-OFF WHEELS · INSERTED-NUT DISCS · AND CYLINDERS

PORTABLE SNAGGING WHEELS · MOUNTED WHEELS · AND POINTS · GRINDING WHEELS

The HARTFORD V-BLOCK FIXTURE applied to Milling

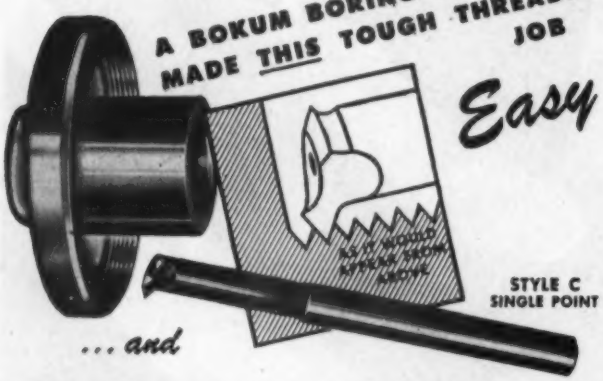
—Saves Time—Assures Accuracy

Many jobs involving the holding of irregular shaped work can be greatly facilitated with this recent "HARTFORD" development. Applied to squaring up the end of a casting in the horizontal milling operation shown here, this new device makes possible taking the cut with utmost assurance that squareness to the holes will be correct. Furthermore it is possible to complete any other cuts or milling of pads at the same time.

The Hartford V-Block Fixture—applicable also to boring, drilling and inspection—is in reality a "New Adaption of an Old Principle." It can be depended on to speed up the toughest set up and thereby prove a worthwhile investment in any shop. It will pay you to investigate, NOW!

Simple in design and construction, the HARTFORD V-Block Fixture consists of a semi-steel base accurately machined and scraped. Provision for secure holding of base to machine table is effected by cross keyways and ample clamping facilities. A set of clamps for positioning V-blocks in the base provide for adjustment of V-blocks. A set of hardened and accurately ground V-blocks with a set of clamps for holding test bars or arbors in place is included as standard equipment with this device.

The HARTFORD SPECIAL MACHINERY CO.
Hartford Conn.



IT WILL MAKE YOUR THREADING JOB EASY

Shank of tool is lined up parallel with line of centers. Bisecting line of thread is always at right angles to machine axis.

In blind holes, threads can reach clear to bottom—no other tool like it. Easy to use. Reconditioning does not change ground thread form (tool is resharpened on top surface only). Results: accuracy and long life.

For super High Speed Tools, ask for Catalog K-1139 and for Carbide Tipped K-398

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14775 WILDEMERE AVE. · DETROIT 21, MICH.

Why the Vertical Roto-Matic Will Increase Your Drilling Production

....is explained in this **FREE BOOKLET**

The ROTO-MATIC principle of continuous operations will enable you to drill, ream, bore, face, mill, etc., more parts in less time. Write for this booklet today; learn the many advantages of the ROTO-MATIC and how it can be specifically applied to your work. Ask for Bulletin No. C-100.

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
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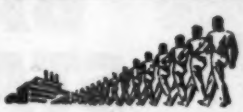
TO INSTRUCT NEW MEN IN THE HANDLING OF DIAMOND TOOLS



we will send you a valuable booklet. No charge, no obligation.

KOEBEL DIAMOND TOOL CO.
9345 Grinnell Ave., Detroit

KOEBELITE DIAMOND TOOLS

Multi - Point, Multi - Set, Multi - Edge, and Single Set. Diamonds for all Industrial Purposes.

Once "Bob" ran emergency errands for you—and he will, again!

Here's Bob—"on leave" from his peacetime job representing your Industrial Supply Distributor ◆—and helping *you* to win the War.

Back in the old days he used to drive around overtime looking for supplies to keep your War Production going on schedule. He *still* is driving around overtime. The "job" he is chauffeuring today doesn't look much like the trim little bus he drove in '42—but the extra skill he is acquiring will stand him *and* you in good stead, come peace days again.

You can show your appreciation for Bob's good work—and for everything your local Distributor is doing to keep you supplied with vital materials—by 'phoning your orders directly to the Distributor instead of writing the factory. You will help the manufacturer to route his production efficiently—simplify deliveries—relieve transportation tie-ups.

Get your essential materials the *logical* way—

Telephone your ◆I◆S◆D◆ FIRST!

ARMY NAVY

ARMY E NAVY

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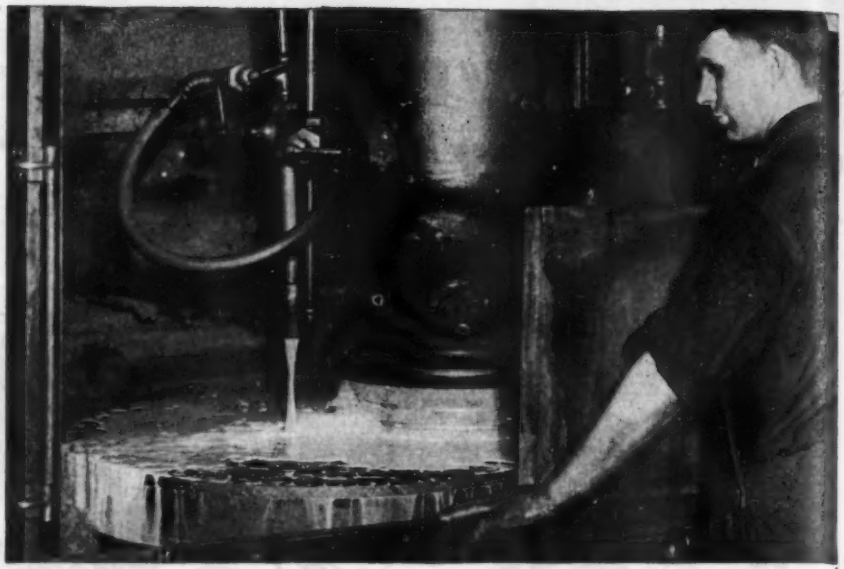
Hitting the Nail on the Head

After The Blanchard Machine Company had tested ECONOMY GRINDING LUBRICANT #1687 against lubricants previously used, they wrote us. . . . "Your Economy Grinding Lubricant #1687 hit the nail on the head and after trying it in our experimental machine, we recommended it for use in our grinding room. . . . We have been using it in our own Blanchards . . . and recommend it to customers."

ECONOMY GRINDING LUBRICANT #1687 disperses quickly in water, gives fast, clean grinding action, smooth finish, and protection against rust.

Handbook 1944-F-18, grinding oils and lubricants, yours for the asking on your company letterhead.



Blanchard Grinder — 2" diameter Master Test Blocks for hardness — alloy steel heat treated — two sides ground — finish 10 micro-inches. Economy Grinding Lubricant #1687, proportion 80 — 1.

THE WHITE & BAGLEY COMPANY

WORCESTER, MASS., Chicago, Detroit, Minneapolis

Darwin

PRK-33 COBALTCROM

Air Hardening, Non-Deforming, Cobalt High-Carbon, High Chromium Steel

In your change-over and re-tooling operations, we refer your Tool Engineer to PRK-33 Cobaltcrom. This alloy tool steel is the ideal material for extended runs and better production records.

We can ship forged discs and ring forgings promptly.

Bar Stock and Billets in Stock. Drill Rods Furnished on Order.

DARWIN & MILNER INC.

highest grade tool steels

1260 WEST FOURTH STREET

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Consistent Quality

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ARTHUR A. CRAFTS COMPANY, INC.

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GRINDING WHEEL DRESSERS

Desmond Cutters *Desmond Hex Dresser*

We manufacture a complete line of Dressers and Cutters. Write for copy of catalog "A".

DESMOND-STEPHAN MFG. CO.

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Canadian D-S Mfg. Co., Hamilton, Ont.

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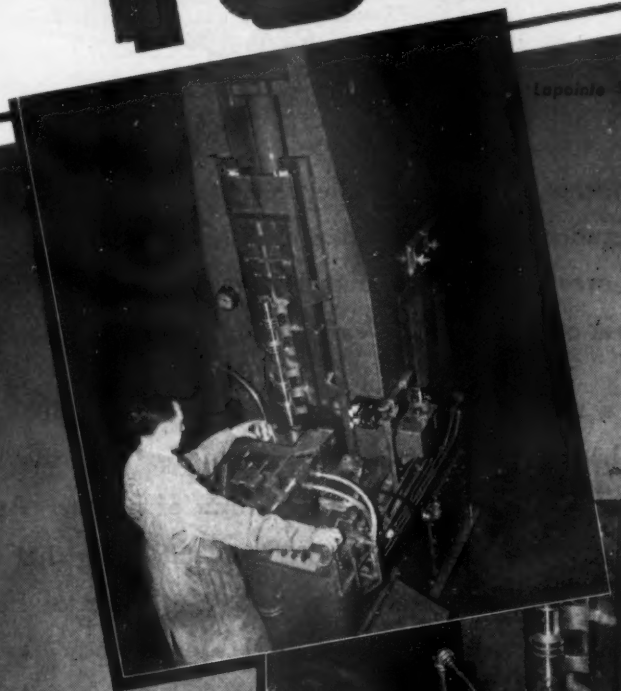
400 an hour!

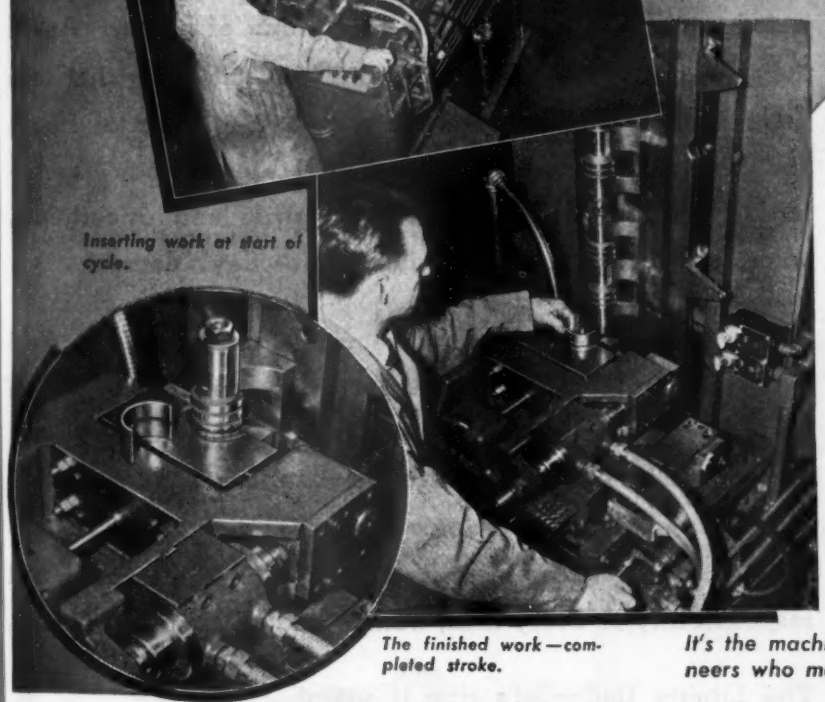


Lapointe Vertical 5-ton.

Producing close tolerance finishes on the inside of engine bearing linings at anywhere near mass production figures was considered an impossibility until broaching was called in. Now, 400 bearings an hour can be made — reducing "breaking-in" periods and eliminating hot spot replacements.

Because of the unevenness of bearing linings broaching engineers figured a maximum and minimum cutting action and devised cutting blades to cover maximum babbit removal. Cutting at 60 feet per minute with a 120 foot return this vertical, 5-ton, 32" stroke Lapointe Surface Broaching Machine produces a finished wall thickness to .0001 tolerance and is one of the fastest cycle time machines on the market. It has a special automatic fixture that makes loading and unloading easy. Each of the cutting blades removes a maximum of .010 each stroke, when maximum stock is to be removed, and are so arranged that regardless of thickness of babbit the bearing comes out completely finished well within tolerance. It operates thus:

1. Work is put in place starting cycle.
2. Fixture moves into cutting position.
3. Machine slide completes cutting stroke.
4. Fixture returns to out stop.
5. Main slide returns ready for next cycle.



Inserting work at start of cycle.

The finished work—completed stroke.

It's the machine, the broach and the unsung design engineers who made this pertinent contribution to production.

ARMY E NAVY

The LAPOINTE Machine Tool Company

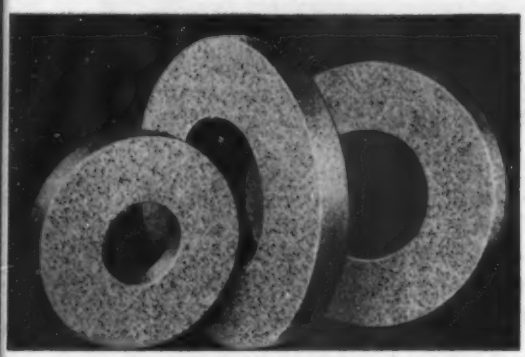
HUDSON, MASSACHUSETTS, U. S. A.

LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

LET'S RING IT AGAIN!

IN 1776, the American people, sick with tyranny and unjust taxation, rebelled. Today, as heirs of the liberty our forefathers created, we have a trust that demands continued watchfulness of our freedom—as individuals and as a nation.

Liberty is a mere word until it no longer exists. Then, it suddenly becomes more precious than life. Ask the subjected peoples of Europe what they think of liberty! Ask if they are not weary of working under dictatorship that tells them where they shall work, orders the number of hours, and dictates the wages to be paid. Ask them if they like living in an atmosphere of continual strife and uncertainty, where tomorrow's action depends upon today's decree!



Our country started as a democracy. Let us keep it that way! Under the influence of war and an uncertain peace, we are no longer farmers, managers, union and non-union workers, or white collar employees. We are Americans! Together, we constitute a tremendous force that can again "proclaim liberty" and restore the blessings of individual enterprise and responsibility to every man, woman and child in the Nation.

The Liberty Bell—let's ring it again!

EVERY STERLING GRINDING WHEEL WE MAKE IS DEDICATED TO LIMITLESS PROGRESS IN A FREE, UNSHACKLED AMERICA

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

When there's "no other way"... look to

AMERICAN SEAMLESS FLEXIBLE TUBING!

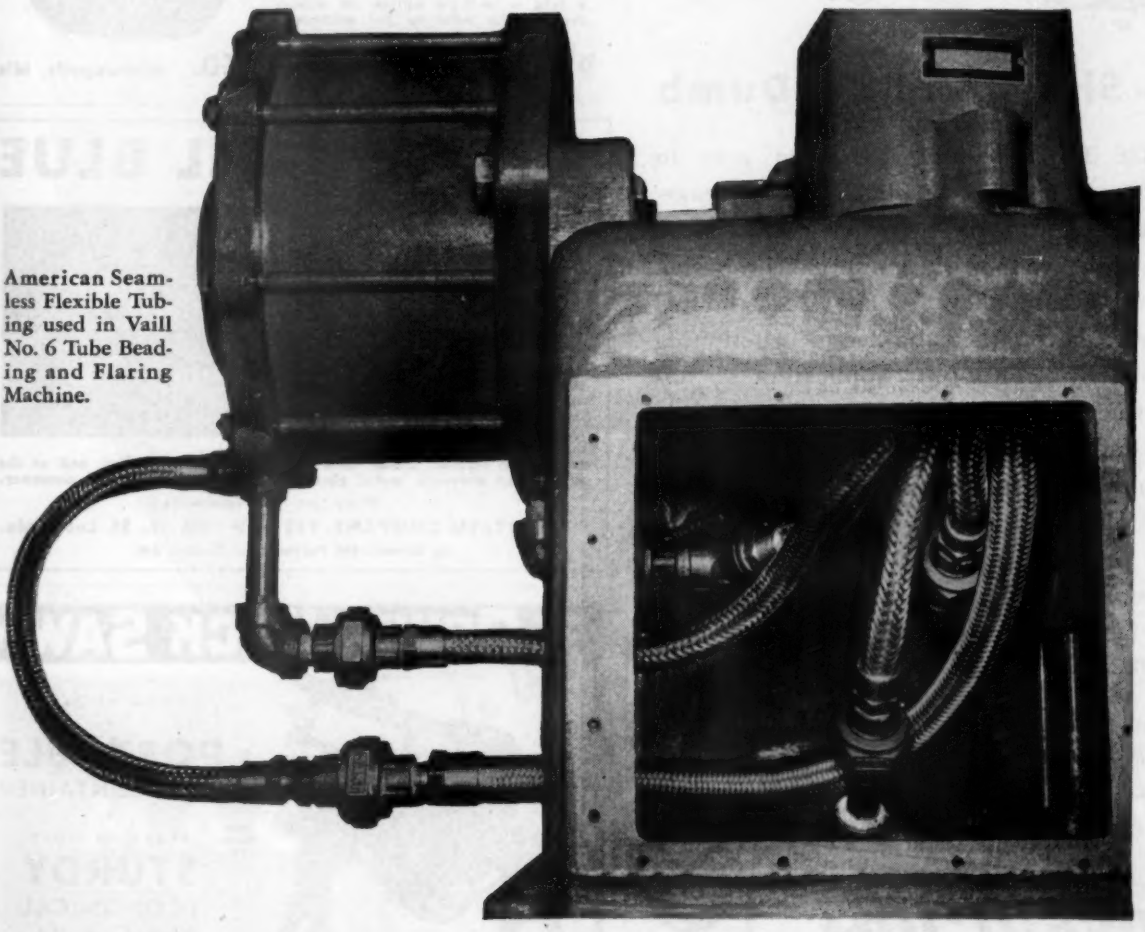
THE AIR LINES of this Vaill No. 6 Tube Beading and Flaring Machine are made of American Seamless Flexible Tubing. Four lengths of ⅜" tubing connect two ports on each of two cylinders with the air control valve. A fifth length of ½" tubing carries the main air supply to the valve.

Mr. John L. Vaill, president of the Vaill Engineering Company, points out that, while there is no movement in the flexible tubing once it is installed, lack of space made it impossible to make the connections with rigid pipe. The use of preformed copper tube was also considered but discarded as impractical. American Seamless Flexible Tubing, as illustrated, is installed regularly in these units in less than an hour's time.

Whenever you have a problem in conveying liquids or gases, in connecting moving or misaligned parts, isolating vibration or in shielding electric wiring, remember that there is an American Metal Hose product that will solve your problem. Assistance of our Technical Department is available on request. Write for our new 40-page Catalogue, SS-50, describing Seamless Flexible Tubing.

44190

AMERICAN METAL HOSE BRANCH
OF THE AMERICAN BRASS COMPANY
Subsidiary of Anaconda Copper Mining Co.
General Offices: Waterbury 88, Conn.
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*



American Seamless Flexible Tubing used in Vaill No. 6 Tube Beading and Flaring Machine.

ANACONDA

American Metal Hose

THE WINNER WITH SPEEDI-DRI

---She's Not So Dumb

FIRST PRIZE for speeding production goes to SPEEDI-DRI—the quick-acting oil- and grease-absorbent that puts a sure, slip-proof footing under employees who have to work around machines that drip oil and grease onto the floor. Sure-footed workers move faster when the danger of slipping is eliminated by SPEEDI-DRI. Application of this light-reflecting, granular material will not only absorb the daily oil deposits but will soon draw the old accumulations of oil and grease from the floors. SPEEDI-DRI also retards fire, saves shoes from oil-rot, helps prevent industrial skin-diseases, reduces porter-labor, improves morale, brightens the plant, cuts insurance costs. Write for literature and FREE SAMPLE.

SUPPLIERS: East—Refiners Lubricating Co., New York 1, New York.
Midwest & South—Waverly Petroleum Products Co., Philadelphia 6, Pa.
West—Waverly Petroleum Products Co., Russ Bldg., San Francisco 4, Calif.

SPEEDI-DRI
OIL AND GREASE ABSORBENT

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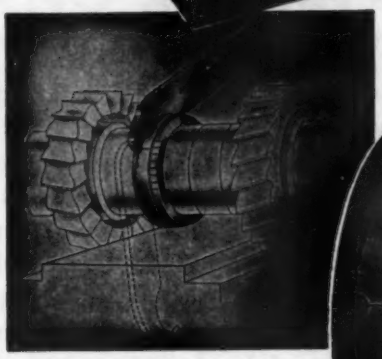
FAST, ACCURATE SPACING
for
SIDE MILLING CUTTERS
GANG MILLING SET-UPS

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

are made in 12 standard sizes for cutter arbors from 3/8" through 2"—other sizes on request.



You have plus or minus .0005" at your finger tips with Dayton Rogers Adjustable Spacing Collars. Graduated in thousands, you can make an accurate and positive adjustment by simply loosening the cutter arbor nut and making necessary corrections as illustrated above.

Try them once and you will never run a gang or multiple milling job without them. Write today for full particulars.

DAYTON ROGERS MFG. CO. Minneapolis, Minn.

DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates

simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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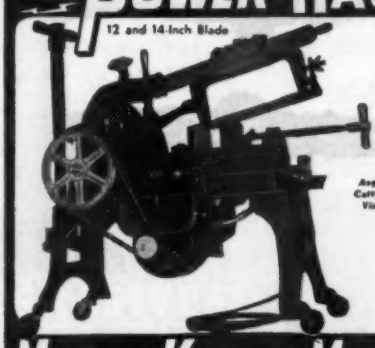
THE DYKEM COMPANY, 2301 B N 11th St., St. Louis, Mo.
In Canada: 446 Pacific Ave., Toronto, Ont.

POWER HACK SAW ★
12 and 14-Inch Blade



LOW PRICED
•
PORTABLE
SELF-CONTAINED
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READY TO WORK
STURDY
ECONOMICAL
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Macklin segments are available for all types of segmental chucks. They are tops for surface grinding.

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FOR EVERY GRINDING PURPOSE WILL

"Protect Your Production"

Ask for the services of a Macklin Field Engineer

MACKLIN COMPANY

***Manufacturers of* GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.**

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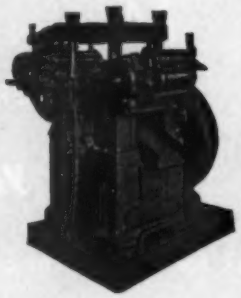
Make use of our exceptionally desirable sub-contracting facilities

Our modern facilities include all necessary equipment for the manufacture of automatic machinery up to the large size represented by the 300-ton Dieing Machine. In addition to our augmented production of Dieing Machines, we are also subcontractors for turbines, Diesel engines, pumps, airplane items, sub-assemblies and other projects calling for both unusual know-how and capacity. We work with you starting at any stage, and will if desired plan and design as well as manufacture. Let us hear from you.

The Dieing Machine Makes Stamped Parts with Improved Economy and Precision



This unique automatic press turns out intricate stampings COMPLETE PER STROKE with an unequalled combination of high production and high precision. Increases die life 600% to 1200%. Sizes: 10 tons to 300 tons.

REQUEST CATALOG 44

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Henry & Wright

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ALMOND THREE-JAW DRILL CHUCKS were the first to be placed on the market over Seventy years ago. As Pioneers in the field of Drill Chucks, the name "ALMOND" has long been associated with the logical procedure of machine developments. ALMOND DRILL CHUCKS are made in types and sizes to fit all machine tools and portable drills.

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The Original Manufacturers of Drill Chucks

T. R. ALMOND MFG. CO.

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How to Accurately Measure Large* Unwieldy Parts...

* Up to 168"

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A NEW IDEA IN GAGES

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May be set in tool room for each job, go to job with job ticket, return to tool room and re-set for other jobs.

Each gage in case with complete set of rods to gage all sizes within frame limits.

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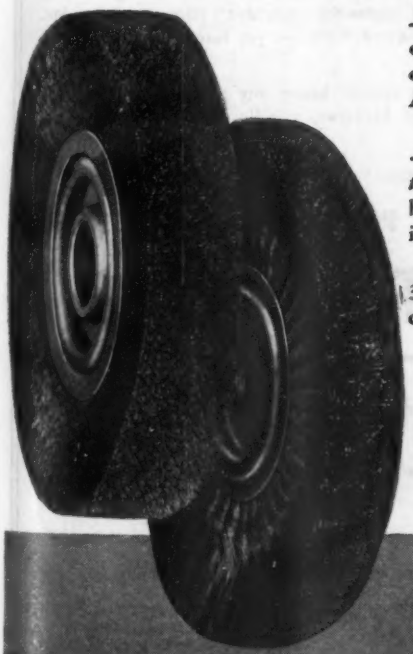
EDDY MANUFACTURING COMPANY

321 PINE STREET PAWTUCKET, R. I.

Rolling... BECAUSE OF A BRUSH



MANY a big 10-ton truck is being kept in service today by the use of an Osborn brush. Power brushing is one of the great wartime discoveries of American industry.

Trucks of all sizes, passenger cars, buses —thousands and thousands of them—are *traveling* today instead of rusting in disuse, because of the application of power brushing to the salvage of automotive parts.

Power brushes, spinning at the rate of 3600 revolutions per minute, today reclaim-clean parts in large garages throughout America. Contrast this with the old, slow method of dousing parts with gasoline to loosen grease and grime, then scraping by *hand*. Jobs now take minutes instead of hours. In addition, power brushing removes nicks caused by handling, and even burrs left in original manufacture. As a result, certain reconditioned parts are better today than when they were new.

This is just one example out of thousands. Industry by industry, America is using brushing tools more and more . . . to speed production, improve product and cut cost.

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WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

FASTER, CLEANER, SMOOTHER

metal cutting *with* VICTOR

First, select the *right* blade for the job . . . see that it is *properly* strained in the frame . . . start the cut at the *correct* angle . . . gauge *speed* and *pressure* of stroke by type and shape of metal being cut.

These, and many other important factors are discussed and illustrated in the booklet "Metal Cutting" prepared by Victor Saw Works, Inc. This is an instruction manual on metal cutting that should be used by every mechanic engaged in machine shops, on assembly lines, in shipyards, on maintenance work, or in the small contractor's shop.

VICTOR hand and power Hack Saw Blades, Frames, and Flexible Back Metal-Cutting Band Saw Blades are designed, processed and heat-treated to give fast, accurate cutting service on metals of many types and under various working conditions. Copies of "Metal Cutting" are FREE. Send for yours today.

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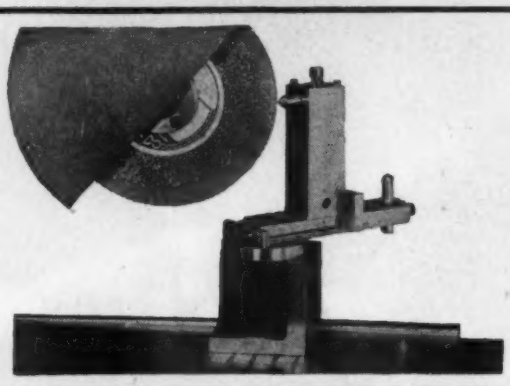
Makers of hand and power hack saw blades, frames, and metal cutting band saw blades.

The "FORM-MASTER"

ANGLE & RADIUS DRESSER



An all-purpose angle and radius dresser for high-precision at low cost. Accurate easily within .001". Simple to operate. Dresses in vertical position enabling operator to SEE the form in work. All parts hardened and ground (except cast-iron base which can be drilled and tapped). Suitable for surface and cylindrical grinders. Two 1/3 ct. diamonds and instrument case included. $150.00.

It readily produces: Any desired angle
Convex radii to 4" on 7" wheel
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Specifications: Base 3" x 3", height 8½"
Wheel capacity 10"
Angular travel 3"

For information or a demonstration CALL YOUR SUPPLIER

Manufactured by

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LAPPING COMPOUND

GRADE NO. 38-900A

A new Compound with a NEW abrasive sharp enough to lap and polish hardened materials, mitrided, chrome plate etc. Gages — Dies — Aviation Parts — yet fine enough for final finishing.

This compound has a special heavy oily paste base especially made for dilution with kerosene, spindle oils.

Large glass jars..... $1.00 each
8½ and 42 lb. cans..... .90 per lb.

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"LMKT" LAPPING LUBRICANT

A substitute for sperm oil on lapping operations.

Single gallon cans..... $2.00 each
6 gallon order..... 1.75 per gal.

Recommended for use on Norton Lapping Machines.

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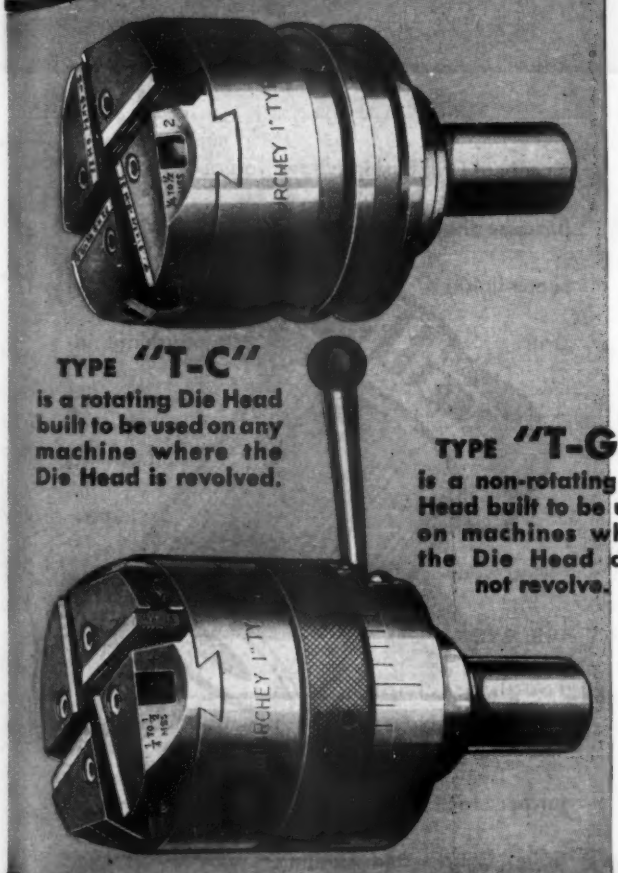
NEW AND IMPROVED TANGENT CHASER

SELF OPENING DIE HEADS!

GREATER ACCURACY-LONGER LIFE



TYPE "T-C" is a rotating Die Head built to be used on any machine where the Die Head is revolved.

TYPE "T-G" is a non-rotating Die Head built to be used on machines where the Die Head does not revolve.

MANUFACTURED of Special Alloy Steel, hardened and ground throughout, these Die Heads (Model "T" series) are expressly made to cut accurate threads on long production runs. They are designed to use Tangent Chasers—giving long chaser life; permanent throat; uniformity of finished work throughout the entire life of chasers and interchangeability of chasers.

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Also ask for literature on Collapsible Machine Tap; Self Opening Die Heads; Thread Milling Machines; Tapping Machines and Roller Pipe Cutting-off Machines.

MURCHEY MACHINE & TOOL CO.

Department A

DETROIT 26, MICHIGAN

MURCHEY

A Tool Room SURFACE GRINDER *That HOLDS Precision Accuracy*

BOYAR-SCHULTZ

No. 618 SURFACE GRINDER

DESIGNED to meet the demand for precision in the most exacting tool and die work, this Boyar-Schultz Surface Grinder is engineered to maintain that high degree of accuracy through long continuous work.

Spindle is specially designed, dynamically balanced and equipped with super-precision, pre-loaded ball bearings; operates smoothly and quietly at 3,000 R. P. M.

Table of close grained Meehanite moves longitudinally only, and on hardened and ground tool steel ways — one V and one flat. Cross feed is provided by the vertical column assembly supported on horizontal tubular steel ways which are ground and lapped to fit assuring long sustained accuracy.

Write for circular describing this smooth running, easy handling machine tool.

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2109 WALNUT STREET CHICAGO 12, ILLINOIS

CAM ACTION GRINDER DOG

Quick action and easy to adjust. Made in four sizes to take all sizes of work from ¼" to 2". Concealed spring holds cam to work. Cannot slip. Write for Catalog A 44.

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IRANISTAN & R. R. AVENUES
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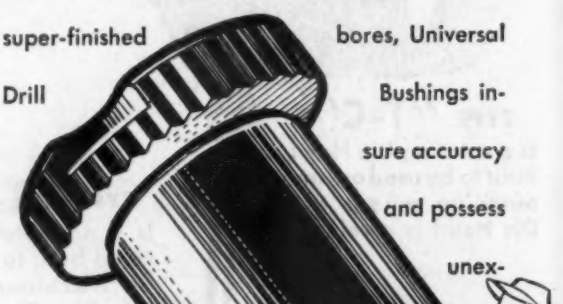
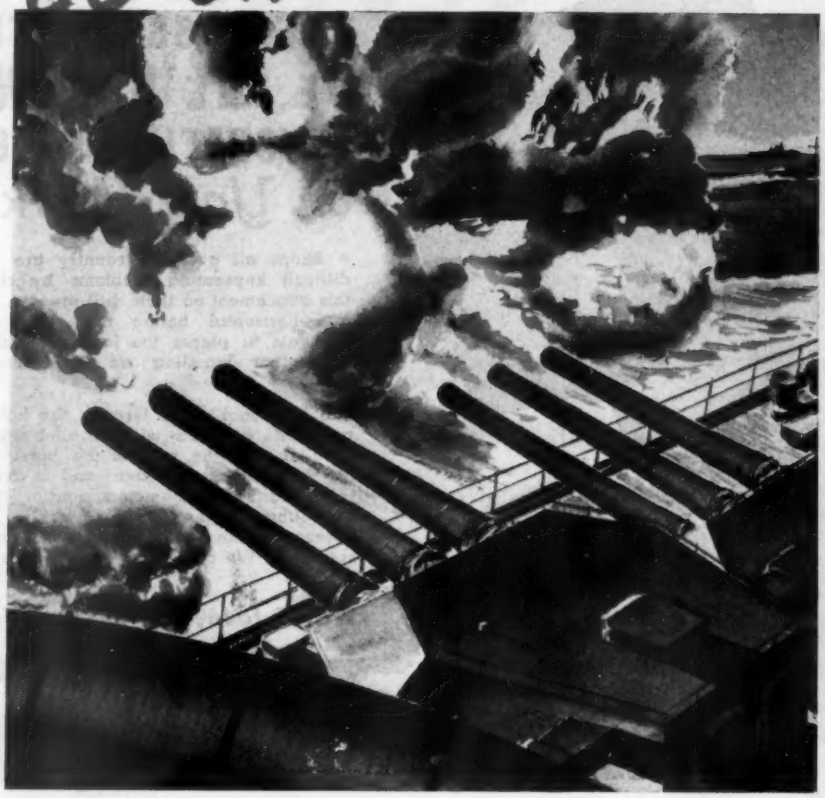
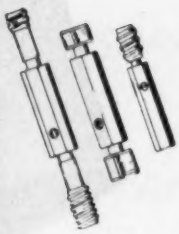
Universal Drill Bushings save valuable tool drills. Because they are straight and round and have super-finished bores, Universal Drill Bushings insure accuracy and possess unexcelled wearing qualities. Tough, precision-made. Write today for further facts about Universal Drill Bushings, Collet Chucks and Floating Chucks.



UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

IT'S "GO" OR "NO GO"





For Launching the All-Out

Navy warships are standing off shore, their guns hurling steel at the enemy. Bombers are overhead, dropping their loads of destruction. Then, when the mighty combined barrage has lifted, landing craft speed forward and our soldiers swarm ashore

This is the ALL OUT, the supreme assault, planned in minute detail. This is no time for something to go wrong, for equipment to fail. When the "chips are down" our weapons MUST work. And *how* they work is determined far in advance, in our war plants, by men who check the accuracy of each vital part. It's the "GO" or "NO GO" of the inspector, and the precision of the gage he uses, which keeps faulty parts from reaching the battle front

This is the responsibility of Kobe Master and Reference gages today. They are in use on countless critical manufacturing jobs where rigid standards of measurement are required. Inspectors rely on them, reject or approve with complete confidence. And their faith is justified. Kobe gages are produced with the finest equipment obtainable, with pre-tested materials and special treating processes. Kobe's ultra-modern plant has constantly-controlled temperature and humidity. Scientific devices rid the air of dust. Every step in the manufacture of Kobe gages is checked on testing equipment so accurate it records tolerances up to 10/millionths of an inch!

Such perfection in Kobe gages is now largely used for war. Tomorrow it will be a valuable asset to America's peace-time industry

KOBE

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KOBE, INCORPORATED

3040 East Slauson Avenue • Huntington Park, California

CRITERION *Boring Heads*

TOOLS of *Quality* for *Quantity* PRODUCTION

Noted for maintaining original accuracy over a longer period. Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. LEAD SCREW IS HARDENED TOOL STEEL, WITH THREADS GROUND FROM SOLID AFTER HARDENING. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

CRITERION
MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

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NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

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IMPROVED TYPE HOLDERS
for stamping into metal, etc.

Hand or Press style. Type can be easily, quickly loaded and unloaded. Simplest construction. Just a sturdy pin holds the type securely. No screws nor springs. Super-quality steel type made in various sizes: 1/32" up to ½" figures and letters.

STEEL TYPE

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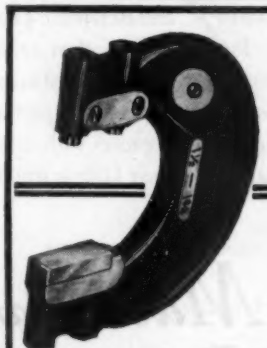

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ADJUSTABLE LIMIT
SNAP GAGE

A Gage with Locking Cams which will stay set

Good Delivery

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PHOENIX GAGE CO., Phoenix, N.Y.

Fly Cutters

PROVE the superiority of Lovejoy Milling Cutter Construction

We have often said that Lovejoy inserted-blade Milling Cutters approach solid steel mills in compactness and strength. When used as fly cutters, the Lovejoy Mill *proves* this statement, because even if *only one carbide-tipped blade* is used in a Lovejoy, *no dummy blades are required in the mill to retain the strength of the body!* This also applies, of course, when two or more blades are used.

If you have not done this to your Lovejoy mills, we recommend that you give it a trial—it will not only pay off in accuracy and high production, but it will save the time ordinarily spent in inserting dummy blades in the housing.

Whether used in the regular way or as fly cutters, Lovejoy mills, with positive-locking blades, will give complete satisfaction on every application. Have you seen Catalog No. 26? It's free on request.

Lovejoy

TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.

MILLING CUTTERS · BORING HEADS · ARBORS · SPOT FACING TOOLS · COUNTERBORES · BORING BARS · SINGLE POINT TOOLS · TURRET TOOL POSTS

One of these Days THEY'LL BE WORKING TO A DIFFERENT SET OF BLUEPRINTS

At your Service . . .

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ADDRESS DEPT. AM-27

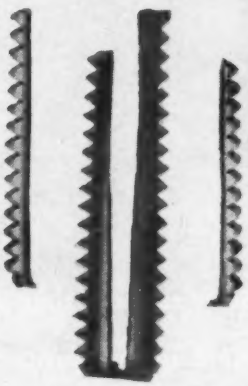
A GREAT many companies—yours probably included—already have a clear idea what items those new blueprints will cover. One thing's sure: whether your future products stay in familiar fields or enter new markets, they'll have to be as modern and value-packed as your engineers can make them. Improved design, and the use of better materials, are the means to the end.

You'll find a lot of your "better materials" answers among the various Allegheny Ludlum families of special, high-alloy steels. If you're looking for such qualities as improved electrical characteristics, finer appearance, greater strength, resistance to heat, wear or corrosion, etc., we have the design and production data you need. Let our Technical Staff help with your plans.

Allegheny Ludlum
STEEL CORPORATION
GENERAL OFFICES: BRACKENRIDGE, PENNA.

W&D . . . B-9330

REMOVE BROKEN TAPS, DRILLS AND REAMERS



By the ELOX METHOD

The Elox method of removing a broken tool from a part being machined might very aptly be called "Disintegrator Drilling". It makes no difference how hard the broken tool may be. A core is drilled down through it by the Elox electrical disintegrator and the core removed. Then the remaining strips of thread of a tap or the cutting flutes of a drill or reamer are easily collapsed and picked out of the hole.

This method does not in any way damage the metal of the work part or the work already done on it. The temperature of the metal of the work part is not raised sufficiently to cause any metallurgical change.

The Elox method is also used to drill holes of various shapes in hardened dies and machine elements without annealing.

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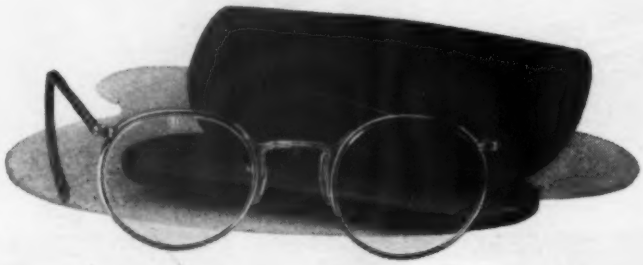
Type "H" Disintegrator

CORPORATION ELOX

3-252 GENERAL MOTORS BLDG. • DETROIT 2, MICHIGAN

Plant—18273 LIVERNOIS AVENUE, DETROIT 21, MICHIGAN

A $1.50 Investment that may save you $1000



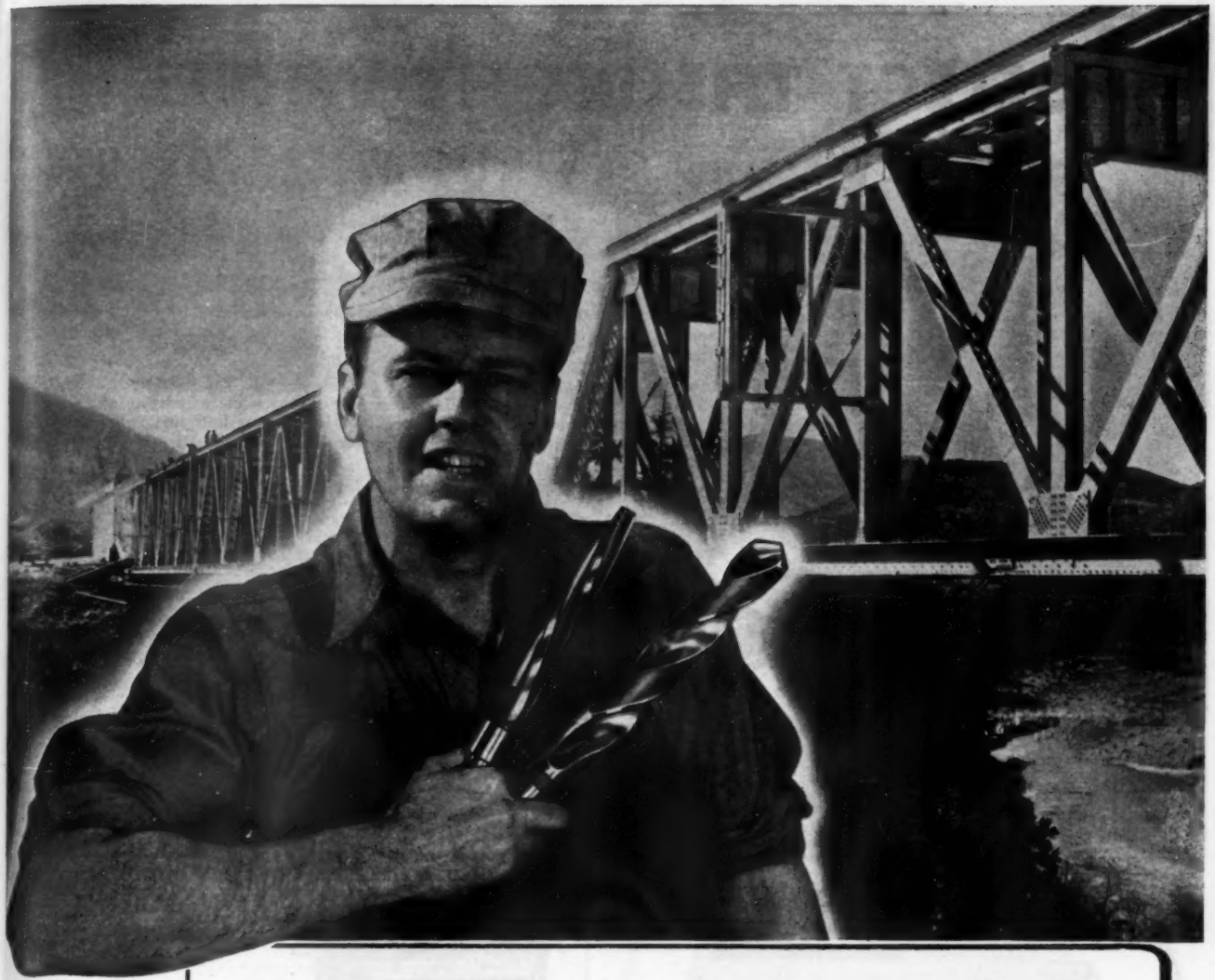
This is a pair of AO Goggles. Their cost: around $1.50. On one of your skilled workers, they may save you $1,000 or more . . . for the eye accidents they help to prevent . . . *and the trained skill they help to protect.*

AO GOGGLES protect eyes & man-hours & profits

They're more than an investment in eye protection. For the price you spend for AO Goggles, you give a worker freedom from fear of injury. You let him concentrate on his job. You help him put in more man-hours. *And you keep production up and costs down.*

American Optical
COMPANY
SOUTHBRIDGE, MASSACHUSETTS

...CALL IN AN AO MAN—AND KEEP YOUR "PRODUCTION-EYES" PRODUCING



TWO SYMBOLS OF RELIABILITY

IN Bridges and in drills you expect the same sturdy qualities you hope to find in men—a readiness to tackle anything; an unquestioning obedience to instructions; a capacity for "sticking to it" until the job is done. Celfor Drills and Reamers meet those qualifications—They are made to.

All the native strength and toughness of finest tool steels are preserved and utilized by Clark's Celfor process. Typical of that tough reliability are Celfor Type B Reamers, made only by Clark; and Celfor high speed Twist Drills, forged to shape and twisted while hot—densifying the metal, producing tools that excel for strength and cutting qualities.

Good business sense—*find out* the facts about Celfor Reamers and Drills.

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Another PRODUCT of CLARK EQUIPMENT COMPANY

CLARK EQUIPMENT COMPANY
BUCHANAN, MICHIGAN

OTHER CLARK PRODUCTS—AXLES (Front and Rear) FOR TRUCKS AND BUSES • AXLE HOUSINGS • TRANSMISSIONS • METAL SPOKE WHEELS
ELECTRIC STEEL CASTINGS • GEARS AND FORGINGS • RAILWAY CAR TRUCKS • BLIND RIVETS • INDUSTRIAL TRUCKS AND TRACTORS

SELECT THE RIGHT WHEEL

AND SAVINGS WILL FOLLOW

Vitrified makes it possible to standardize on grinding wheels by offering a wide range of standard types which cover practically all wheels used on standard makes of grinding machines.

Selection of the right wheel for the work to be handled is simplified in the Vitrified catalog—a 65-page booklet which gives specific data, dimensions, etc., covering the entire Vitrified line.

Send for this catalog. Choose a grinding operation in your shop on which you would like to cut costs. Select the Vitrified wheel which meets your specifications, try it out, and compare results with the method formerly used—and you, too, will join the long list of progressive manufacturers who have standardized on Vitrified.

Write for the catalog today

VITRIFIED

VITRIFIED WHEEL COMPANY
WESTFIELD **MASS.**

Designed to SOLVE YOUR MARKING PROBLEMS

Out of greatly accelerated production and seemingly impossible demand for faster, better metal marking, have come many improvements and innovations now reflected throughout our complete line of precision marking equipment. Your copy of our new catalog supplement No. 43 is now ready. It is a guide to the newest type of precision marking equipment designed for today's wartime needs and with an eye to the future.

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MARK IT BEST WITH NOBLEWEST

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STEVENS MILLING MACHINE VISES
5 in., 6 in. and 7 in. sizes
All parts Interchangeable
JOHN B. STEVENS INC.
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LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
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HARDNESS TESTER

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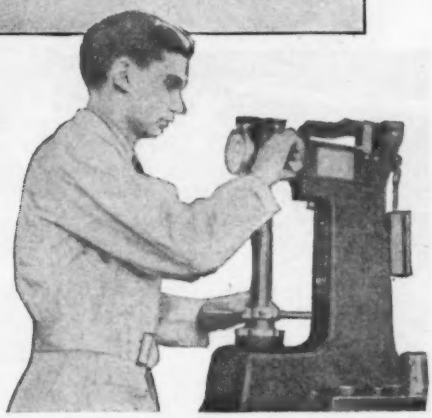
The Most Important Thing
To Look for
in Resistance Welding Electrodes
is Something You Cannot See . . .



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Prescribing the proper electrode alloy for a specific welding job is important. Even more important is the ability to make that alloy so that its composition never varies in process of production.

Here at Mallory we have mastered the art. We know how metallurgical processes affect our alloys. We know what physical and electrical properties they impart. And we duplicate them again and again through a rigid system of quality control.

This thorough and scientific regulation starts with the raw materials. It continues through every detail of operation to the finished tip, roll or die. It follows the finished product into your plant, checking on performance in actual operation. It includes hundreds of sample melts in experimental furnaces, Rockwell tests for hardness, microscopic examinations for grain size, repeated alternating stresses in fatigue machines, elastic limit determination, exact measurements of tensile strength, electrical and thermal conductivity.

With such attention to detail, it is possible for you to establish high speed set-ups and procedure which, once fixed upon, require little if any change. Write today for specific data.

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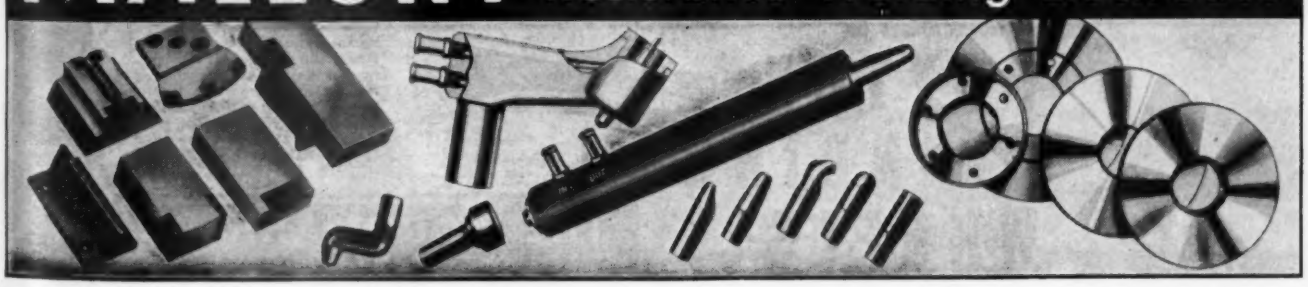
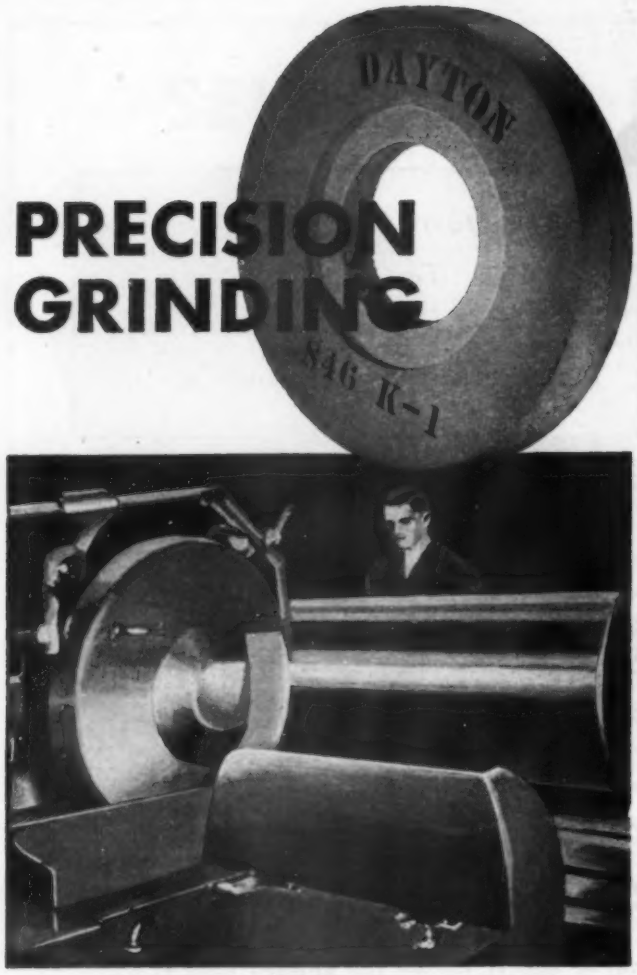
P. R. MALLORY & CO. Inc

MALLORY *Standardized Resistance Welding Electrodes*



PRECISION GRINDING



- HIGH PRODUCTION
- REQUIRED FINISH
- LONG WHEEL WEAR

If your precision grinding need is a wheel that will give you fast stock removal with better than required finish — and yet also give you a high production rate per wheel — then put down "DAYTON GRINDING WHEELS" for immediate trial.

You'll find Dayton Grinding Wheels have what it takes — are engineered to fit your job and to do that job precisely as the operation requires.

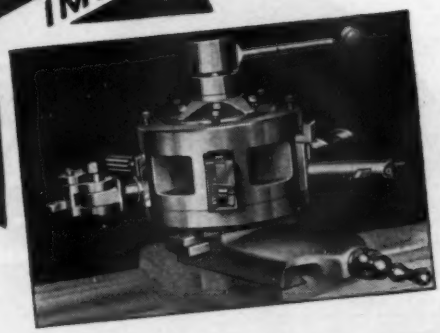
Wheels of many sizes, grains and grades are regularly carried in stock. Just write, wire, or phone us.

SIMONDS WORDEN WHITE COMPANY
712 Negley Place Dayton, Ohio

MANUFACTURERS OF

DAYTON GRINDING WHEELS

Our NEW IMPROVED



5 STATION LATHE TURRETS FOR THE POST-VICTORY YEARS

OUR NEW IMPROVED TURRET HEADS are a Vital war-time necessity in machine shops and plants today. Also Vital for your Post-War planning where COMPETITION will be so keen — tomorrow. For the Victory years ahead, order now, equip your machine shop or plant with OUR NEW IMPROVED TURRET HEADS.

5 TOOLS IN POSITION *for* **INSTANT CHANGE**

ALLOWING MINUTE ADJUSTMENTS WITH 10 ACCURATE TOOL POSITIONS

Write Today for Complete Details

AUTOMATIC MACHINE & TOOL CO. ENGINEERED PRODUCTS AUBURNDALE, MASSACHUSETTS

Made up in Four Individual Sizes

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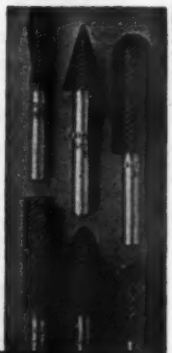
ROTARY FILES

Hand Cut • Milled Cut Ground from the Solid

There is a GROBET ROTARY FILE in shape, size and coarseness of cut for every type of hard or soft metal, plastic, wood, etc. GROBET FILES do their jobs beter and stay sharp longer. *Send for catalog DR, the most complete of its kind illustrating and describing GROBET Rotary Files, Diesinkers, Burs, Tube Burring Cutters, Chatterless, Countersink, etc.*



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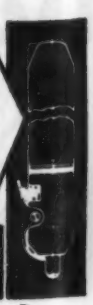
12 characters, more or less, stamped at one blow. Press the thumb clip and quickly change type or dies for next markings. No weakening groove in type. Heavy Duty Type with "Extra Strength Shoulder" stamps any untempered steel, or other material. Ask for HERCULES HOLDER & TYPE.



THE ACROMARK CO.
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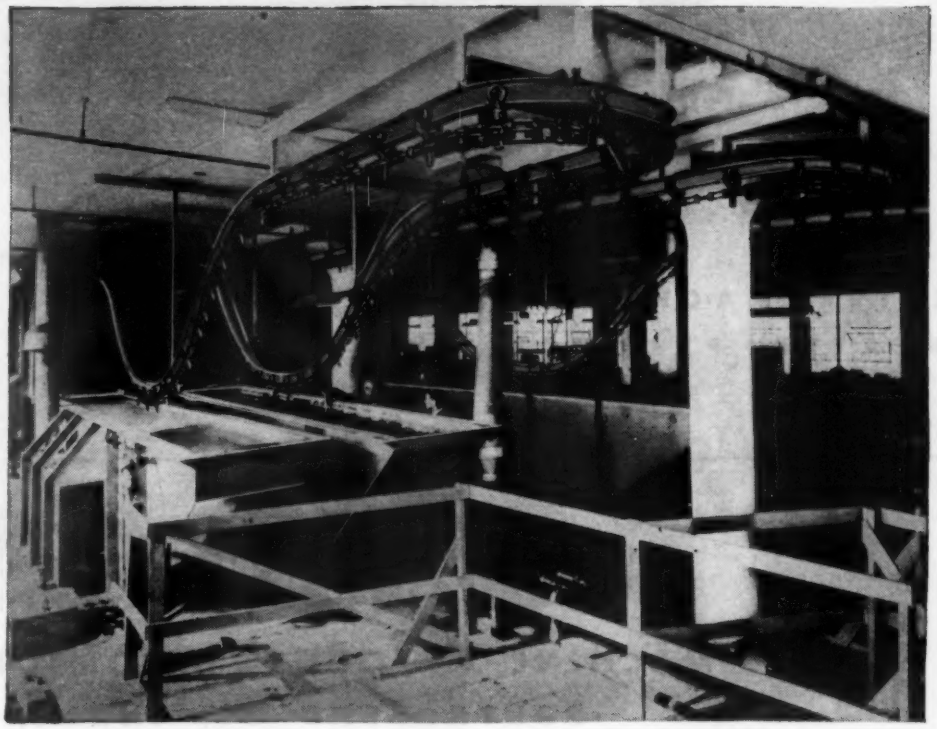
Magnus Methods—Materials—Machines for Metal Finishing



Magnus Machine for Cleaning and Rust-Proofing Automotive Parts

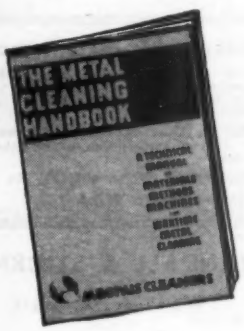
This completely automatic machine, designed and built by Magnus, takes all but the very largest spare parts for automotive parts and cleans, rustproofs them and delivers dry, cooled parts ready for overseas packing. Though two different types of rust-proofing are provided, applicable to different parts, no intermediate manual handling is necessary.

Let Us Help You Select the Most Suitable Set-Up for Your Cleaning Operations

We can help you select the method, the cleaning material and the kind of machine that will most effectively get your metal parts ready for any particular finishing operation and at the same time, put this phase of your operations right into the production line.

Since Magnus makes the cleaning materials and designs and builds the machines, there can be no bias in the recommendations we make. We can freely recommend the method and the cleaner which will do the best cleaning job on your particular units, based on your particular processing operations and the required finish. We can design and build the machine your production line demands, whatever your particular limitations of floor space and handling methods may be.

If you have any immediate problems along these lines, won't you put them up to us for a mutually frank and unprejudiced discussion? If you are making any post war plans, involving metal finishing, we'd like to work with you in the design of suitable machines and methods.



THIS COMPLETE MANUAL BELONGS IN YOUR FILES!

This handbook is the only one we know of which covers all methods, materials and machines used in metal finishing in a complete, authoritative treatment. You will find it mighty helpful.

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Magnus CLEANERS-METHODS-MACHINES

BETTER MACHINE TOOLS = GREATER PRODUCTIVITY
GREATER PRODUCTIVITY = INCREASED PROSPERITY

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MACHINE & FOUNDRY CORPORATION
SOUTH BEND 23, INDIANA

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This Special Service Report **FREE** *for the asking!*

Are you having trouble with coolant solutions going rancid and giving off disagreeable odors? Must you make up new solutions too frequently? Then you will want to read a NEW 4-page Service Report outlining helpful precautionary measures for combating bacteria growth in oil-water emulsions.

It describes materials and techniques for thoroughly cleaning out main supply tanks, individual tanks on machines, supply lines and pumps . . . gives subsequent germicidal procedures. Also included are 11 valuable plant and individual sanitation tips designed to help you combat solution contamination . . . minimize dermatitis infection. Write for FREE copy TODAY!

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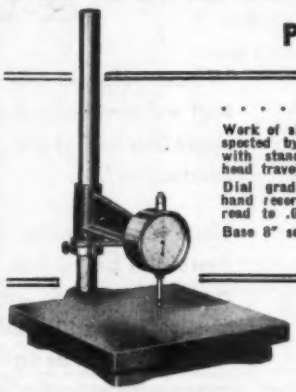
Technical Service Representatives in Principal Cities of the United States and Canada

OAKITE Buy Bonds for Victory **CLEANING**

The RANDALL & STICKNEY Platform Gauge



. . . . takes work up to 7 inches

Work of similar size can be quickly and easily inspected by setting gauge head at desired height with standard block or plug. Spindle on gauge head travels ½".

Dial graduated 0 to 50 in thousandths; second-hand records 10ths of inches. Can be furnished to read to .01 mm.

Base 8" square; height 13"; weight 18½ lbs.

Investigate Now!!

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"ROCKWELL" HARDNESS TESTER

These new improved type testers available from stock.

Made Only By

WILSON
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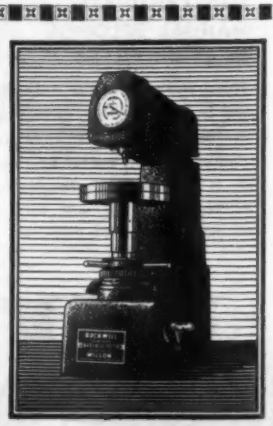
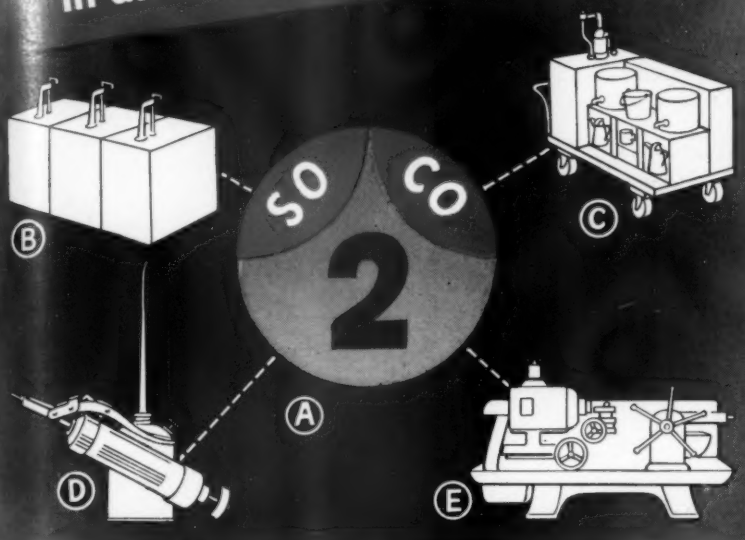


How to get the right lubricants in all of the right places



A. A code number is assigned to each lubricant used in the plant and a bright numbered decal like that above is applied to every container and lubrication point.

B. Each storage container has one of these numbered decals on it to indicate the lubricant it holds.

C. Every container on the lubrication cart is marked with a numbered decal.

D. Every oil can or grease gun is identified by a decal and filled from the cart or storage container with that numbered lubricant.

E. Every spot to be lubricated on each machine is marked with the code number of the lubricant required.

Standard Coded Lubrication Service

...helps your oilers put lubricants where they belong

YOU HAVE spent much time and effort determining just which grease or oil is the best for each type of service in your plant. Haven't you wondered at times whether the thousand and one spots to be lubricated *always* get the *right* lubricant?

We have developed a simple method that will relieve you of that worry. It's Standard *Coded* Lubrication Service. The diagram above briefly explains how the system works.

The only record you need to keep is a lubrication chart listing the lubricants used in your plant, and the code numbers assigned to them. These numbers have no significance outside of your plant. You order lubricants by brand name just as you do now, *but apply them by number.*

Standard Coded Lubrication Service offers these advantages:

Prevents breakdowns resulting from the application of the wrong lubricant.

Simplifies training and instructing new oiler crews.

Saves oiler time by eliminating the need for looking up lubrication recommendations for individual machines.

Fits any lubrication program.

Simplifies lubrication requirements.

Avoids confusion of brand names.

Any of the advantages above is ample reason for calling your Standard Oil Industrial Representative for further information. Discuss it with the men in charge of your lubrication. For the Industrial Representative nearest you, or further information, call your local Standard Oil Company (Indiana) office, or write 910 South Michigan Avenue, Chicago 80, Illinois. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

Gasoline Powers the Attack . . .
Don't Waste a Drop!

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ LUBRICATION ENGINEERING

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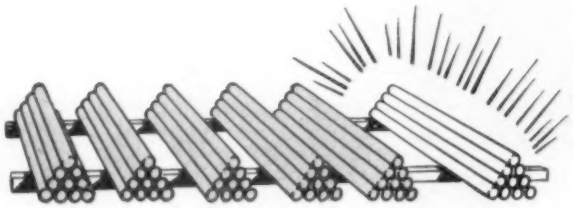
Rust Prevention *News*

Practical suggestions from the field on how rust preventives are being used by midwest operators to overcome waste of metal and time.

JULY, 1944



Five piles of steel stock rusted—one pile didn't at a Michigan tube manufacturing plant. The six orders of steel came from six different mills. In ordinary times the user probably wouldn't have tried to solve the mystery. He would have changed his source of supply and ordered the steel that didn't rust. But these aren't ordinary times so he tried to find the reason. It was simple—the manufacturer of the rust-free stock protected it with Stanorust. Let *us* make the suggestion before *your customers* do. Look into the advantages of Stanorust for protecting the parts you manufacture.

Absence makes the heart grow fonder might be the title of this short news item from a midwestern maker of small tools. Tools in stock were protected against rust by Stanorust. Suddenly customers began to complain—they were getting rusted tools. The superintendent investigated. Someone had decided to try another rust preventive—they all looked alike. Needless to say, another change was made—back to Stanorust. Complaints stopped. And the superintendent is more certain than ever that he does not want anything but Stanorust.

Transparent rust preventive makes inspections of machined surfaces easier—that's one reason why a Wisconsin motor parts manufacturer picked Stanorust 00 to coat all piston rings. Another reason—it was easy to put on. Parts were just dipped in Stanorust and allowed to drain. It gave needed protection while rings were handled in production and inspection, and the rings did not require cleaning when installed. Some of these may be good reasons for you to test Stanorust.

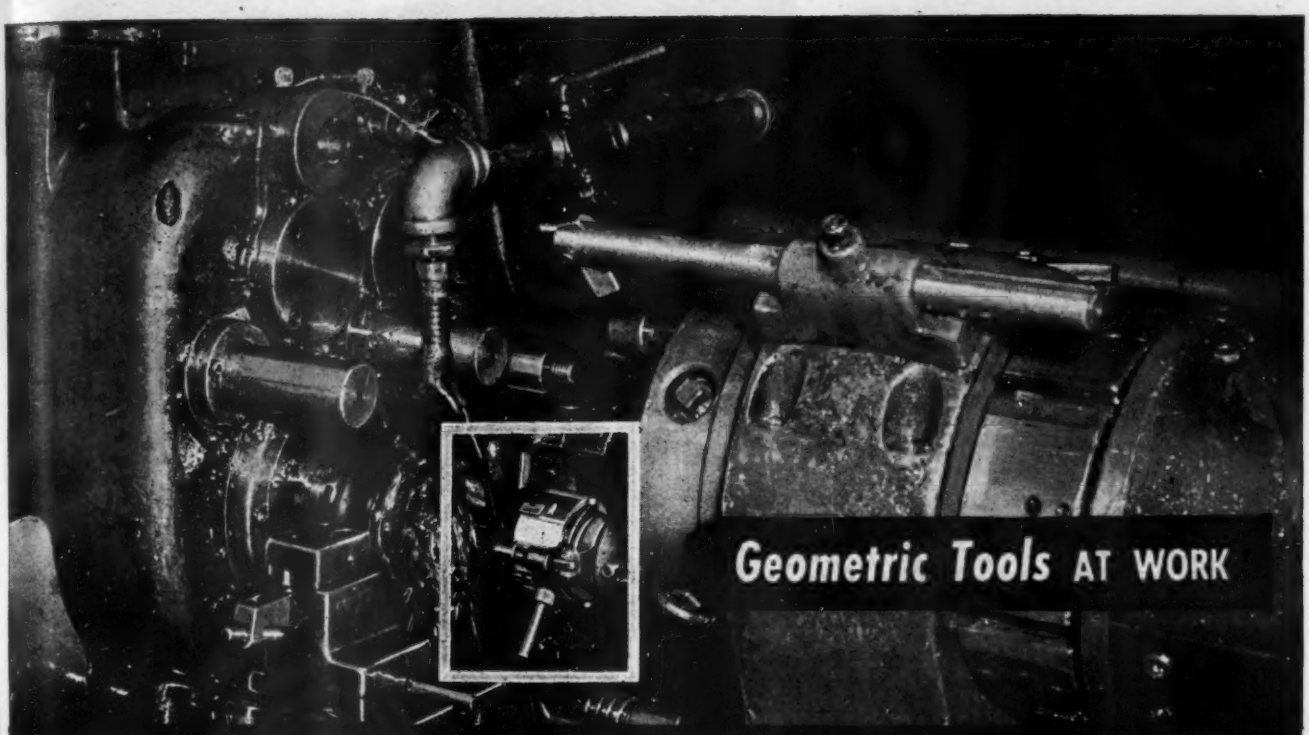
An unusual rust preventive application is found at an Iowa plant. If you saw a plant hand working around piles of bar stock with a garden sprinkling can, you might suspect he'd discovered a new steel-growing Vitamin B. He's not growing steel—he's saving it. By applying Stanorust to the stock piles with a sprinkler, rusting is kept to the minimum — without a great amount of labor. This method won't work in all cases —it was round bar stock piled loosely in this instance—but there is always an easy way to apply Stanorust, by swabbing, dipping, brushing or spraying.

Your rust preventing needs can be quickly analyzed by a Standard Lubrication Engineer. He has rust preventives for every type of metal protection. Many of them meet government specifications. For further information call your local Standard Oil Company (Ind.) office. or write 910 S. Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

Gasoline Powers the Attack . . . Don't Waste a Drop!

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

ULY '6



GEOMETRIC DIE HEADS speed "Bell" production

ARMY E NAVY

For the accurate threading of a wide variety of airplane parts, Bell Aircraft Corporation applies Geometric speed and precision to its stepped-up production schedules, as exemplified by the "on location" shot, above. Here, as in many other plants mass-producing planes, guns, tanks and shells, Geometric Die Heads and Taps are proving their ability to give long runs of accurate threads on all types of material—tough, stringy alloys, hardened steels, soft metals, brittle plastics. Geometric tools are correct for almost every internal threading job from 1" to 8-1 2" dia.; for external threads from 1 16" to 6"; for coarse threads and threads as fine as 80 per inch. Consult Geometric for the correct solution to any threading problem!

GEOMETRIC
TOOL COMPANY

★

Machinery and Tools for cutting Screw Threads

★

NEW HAVEN 15
CONNECTICUT

Class S, a universal Collapsing Tap for almost any machine and almost any internal threading job over 1¼" dia.

for saving Precious Chasers

While Milled Chasers should be ground on the chamfer, and the cutting face occasionally touched up, Collapsing Tap Type Chasers are usually ground on the cutting face —with an occasional touching up on the chamfer, provided they do not have to work to a shoulder.

WORK FASTER WITH KESTER CORED SOLDERS

• Even with inexperienced help—production lines take on new speed and efficiency when Kester Cored Solders are used. Guesswork is eliminated because alloy and flux—each in the correct amount—are applied in one simple operation. Work is fast, sure.

• The superior quality of Kester alloys enables them to stand up under bending, vibration, shock, contraction and expansion. Fluxes are carefully compounded, pure and efficient.

• Kester Cored Solders are available in a wide range of core and strand sizes—one of which is exactly suited to any production requirement. Let Kester engineers assist you in improving soldering operations in your plant. Write fully—there's no obligation.

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Finest Quality FOR 45 YEARS 1899-1944 KESTER SOLDER

☆ BUY WAR BONDS ☆

TIN ORDER AMENDED. For the present, if you require solder of more than 20% tin content, certify use on Kester orders; under WPB Order M-43 as amended November 3, 1943. Priorities Preference Ratings now govern only the scheduling of deliveries.

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Cored Solders
STANDARD FOR INDUSTRY

ERRINGTON
STAPLETON, STATEN ISLAND, N. Y.
MULTIPLE HEADS

Super-Sensitive Fixed Center Multiple Drilling Heads

Fixed-Center Auto-Reverse Multiple Tapping Heads

All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

LEADING THE INDUSTRY IN CARBIDE TOOLS SINCE 1930

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TANTUNG CUTTING TOOLS — DIES

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HOLMAN BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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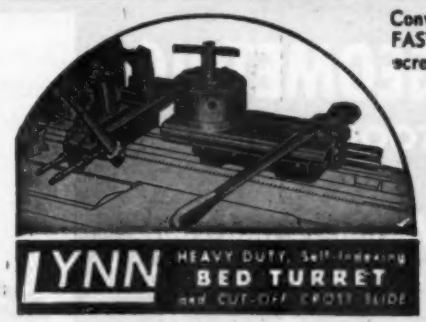


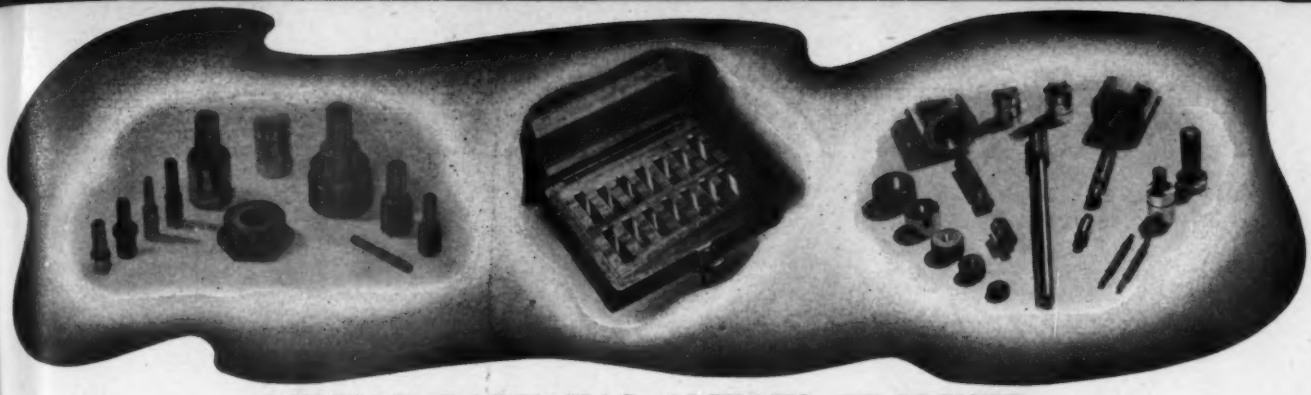
LYNN HEAVY DUTY, Self-Indexing BED TURRET and CUT-OFF CROSS SLIDE

Rigidly Accurate, Easy to Operate

Distributed nationally through jobbers. Immediate delivery from stock or factory

Convert your lathes for FAST, precision hand screw work with sturdy, finely constructed Lynn units. Lynn Model BT-1 (shown at left) fits standard small and bench lathes up to 13" swing. Model BT-3, for standard engine lathes up to 24" swing. Also cut-off Cross slides, and LYNN Tool Post Turrets for lathes from 12" to 28" swing.

LYNN MFG. CO., 224 Elroy St., Minneapolis 8, Minn.



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GAGES and TOOLS of *Lasting* PRECISION

TRUE value and economy in gage use is measured in wear resistance . . . in the inspection accuracy which is maintained well along in the service life of the gage.

It is natural to think of gage wear resistance in terms of materials. Lincoln Park Carboloy gages are known to offer at least fifty times and Lincoln Park chrome plated gages approximately five times the wear resistance of those made of steel. But in any material, and especially in steel, a high surface finish is of paramount importance in guaranteeing a long, accurate service life.

At Lincoln Park, careful control in grinding and lapping produces gages with extremely high finish. A large department, parts of which are shown at the left and which is operated under ideal working conditions and staffed with highly skilled men and women, is devoted to lapping operations alone. Here Lincoln Park Class XX and X gages are finished with Profilometer readings no greater than 1.5 microinches. Readings no greater than 2.5 microinches are guaranteed on Class Y gages.

From Lincoln Park you get gages . . . and many types of precision tools . . . all of which are manufactured to provide the maximum in *lasting* precision.

ARMY (E) NAVY

LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

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Circular and Flat Form Tools, Gear Cutters, Counterbores, Gear Shaper Cutters, Reamers

NATIONAL Tools CLEVELAND

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Special Tools, Hobs, Ground and Unground, Slitting Saws, Broaches, Milling Cutters, Herringbone Cutters

When it's all over—

Users of cutting tools can depend upon having National Cleveland Tools—accurate and durable—for peacetime production.

National Tool Company will have no conversion problems. Its 38 years of experience are at your service today, tomorrow and always.

Onward, America!

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REED KNURLS

More than 100 Different Styles and Sizes IN STOCK for Prompt Delivery. All Standard knurls now available in either CARBON Steel or HIGH SPEED Steel.

Special Knurls made to your specifications

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REED SMALL TOOL WORKS

WORCESTER 2, MASSACHUSETTS

...WORLD BY THE TAIL AND A DOWN HILL PULL

IF IT'S A PLOMB PULLER

Any pulling job is likely to be a mean job — unless you use a Puller you can depend on. Expert mechanics throughout war industries like Plomb Pullers because they give better, safer, longer-lasting service. They choose the other service tools in the complete Plomb Line, too — for the same reasons. From tiny screw drivers to mammoth industrial wrenches, all are built to highest quality standards. Select the ones you need for your war job from the Plomb dealer in your neighborhood.— *Plomb Tool Co., Los Angeles 54*

NE SERVICE TOOLS FOR ALL INDUSTRIES

VETERAN!

Unretouched photo of a National milling cutter after long and hard service. Because of regular resharpening this cutter lasted far beyond its normal life expectancy.

Hours can be added to the useful life of cutting tools by a policy of regular resharpening. Sharp tools last longer, produce more and better work.

NATIONAL

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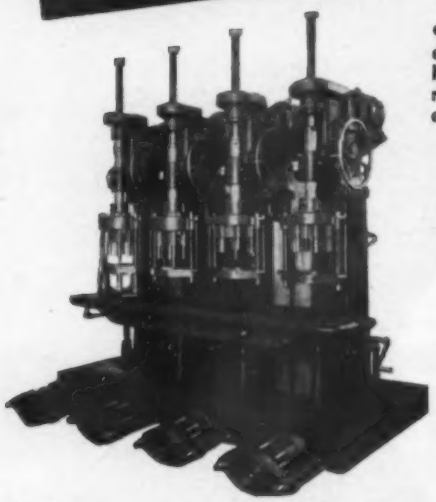
Versatility of HOEFER HEADS

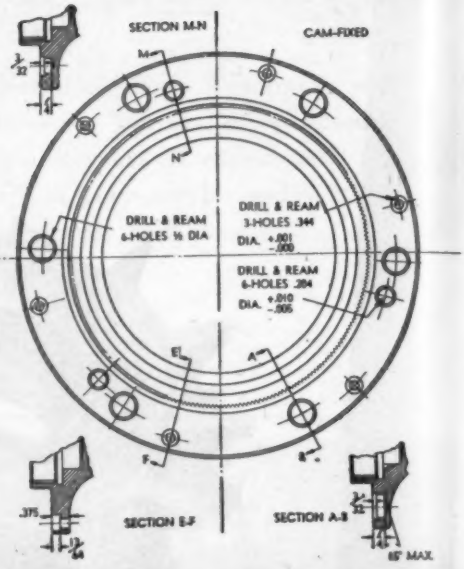
Speeds Production in Many of America's Armament Plants



• The line drawing shows a typical job done by HOEFER Multiple Spindle Heads. The machine at left drills and reams 15 holes in three different diameters and to three different depths.

• HOEFER Heads used for such important work as that of armament production adds further proof to the ability of these heads to simplify the drilling of holes in multiple and to speed up the work. Also it suggests the great value these heads can be to you in your post war production.

• Due to our long years of experience in producing multiple spindle heads for a wide variety of applications we are in position to study your problem and suggest the correct head to fully meet your production need. Send us your blueprints and number of parts you need for one day. Save on the purchase of costly drilling equipment.



Hoefer's Whole Business is Holes . . . .

HOEFER MFG. CO. *Freeport, Ill.*

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Gentlemen: Kindly send me your new FREE Catalog covering A.B.C. Drill Jig Bushings

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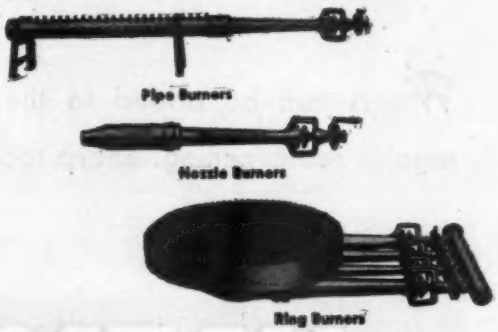
. . . just connect to gas supply



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Send for the "BUZZER" Catalog showing complete line of Industrial Gas Burners, Furnaces and other equipment.

CHARLES A. HONES, INC.
121 So. Grand Ave. Baldwin, L. I., N. Y.

"Gulf Cutting Oils

HAVE MATERIALLY INCREASED OUR PRODUCTION AND TOOL LIFE"—

Says this plant Superintendent

Actual photo of a Gulf Service Engineer consulting with Superintendent of aircraft parts plant. This plant has considerably improved machining practice with Gulf Lasupar Cutting Oil and Gulf Cut-Aid.

"This Gulf Service Engineer

GIVES US THE RIGHT RECOMMENDATION FOR EVERY MACHINE AND TYPE OF WORK"

THIS is one of hundreds of war plants that have secured greater production and longer tool life from the use of the proper Gulf Cutting Oil for every machine and type of work, as recommended by Gulf Service Engineers.

Here's the important reason why Gulf Cutting Oils help improve machining practice: Every Gulf Cutting Oil has specific properties which insure better performance on certain types of cutting jobs! Gulf Lasupar Cutting Oil, for example, is used to advantage by the shop shown above. This oil is manufactured by an exclusive process that secures characteristics uniquely advantageous to many cutting operations.

Call in a Gulf Service Engineer today and ask him to show you how Gulf Cutting Oils can help you improve production and tool life and obtain better finishes. For your copy of the booklet on Gulf Cutting Oils, send the coupon below.

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Please send me, without obligation, a copy of the booklet, "Gulf Cutting Oils," which includes a 45-page Machining Guide.

Company_____

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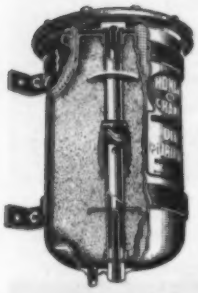

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for direct connected installation on hydraulic machine tools, presses and many types of mobile equipment. Purifiers are furnished with legs or mounting bands. Will remove abrasives, sludges or acids as fast as they are liberated by operating equipment.

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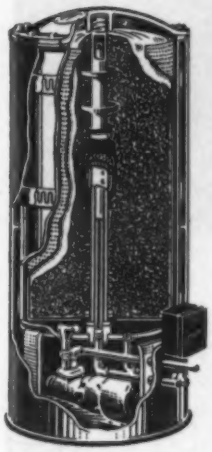
• A complete line of proven oil purification equipment that will effectively handle any problem of the purification of dirty or contaminated industrial oils. These purifiers guarantee maximum protection for operating equipment.



HONAN-CRANE "CONTINUOUS" OIL PURIFIERS
will remove solid and soluble contamination from oil as fast as it is liberated by the operating equipment. Gives positive control of the neutralization factor in Turbine oils. Standard units available for Gas and Diesel engines up to 20,000 H. P., for Turbines up to and over 10,000 gallons, also for Hydraulic, Insulating and all kinds Industrial oils.

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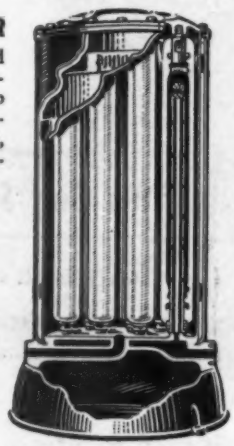
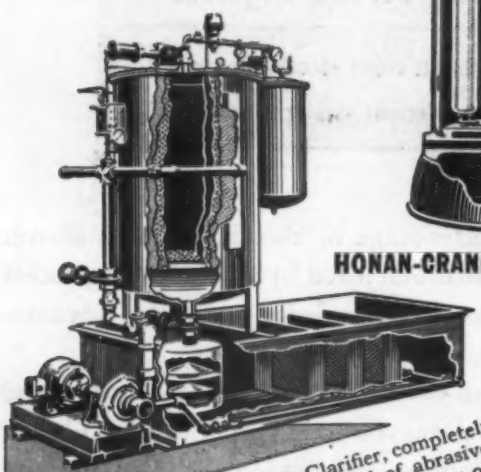
will handle *"high flow"* demanded in certain types of installations. Cartridge type refills, double decked to conserve space. Ideal for marine installations. Can be used with electric, steam or hot water heaters. Streamlined in design and full insulated.





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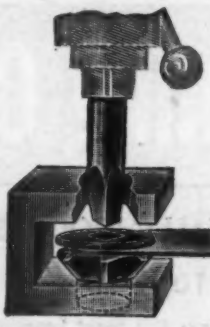

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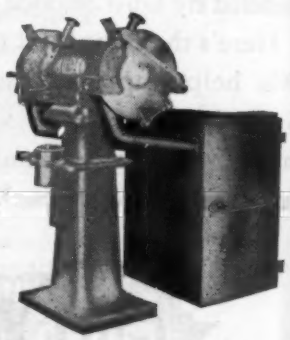

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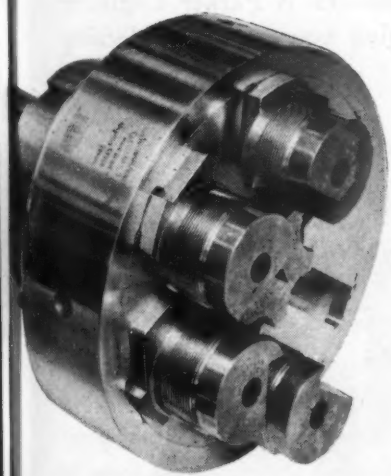

New Catalog D-42B brings you complete data on Namco Circular Chaser Dieheads, and shows you how to save time and money on long-run precision threading and hollow mill work.

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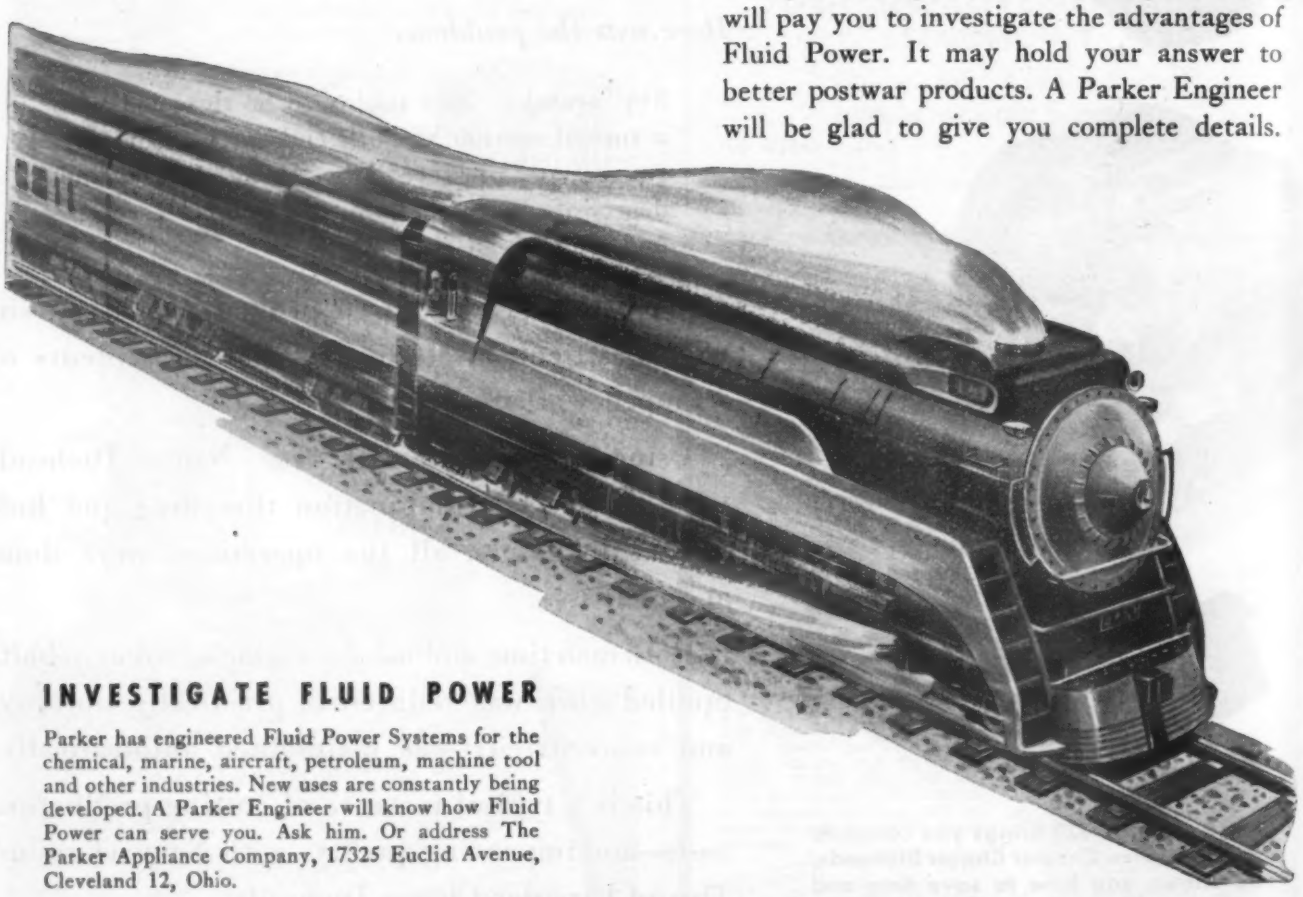

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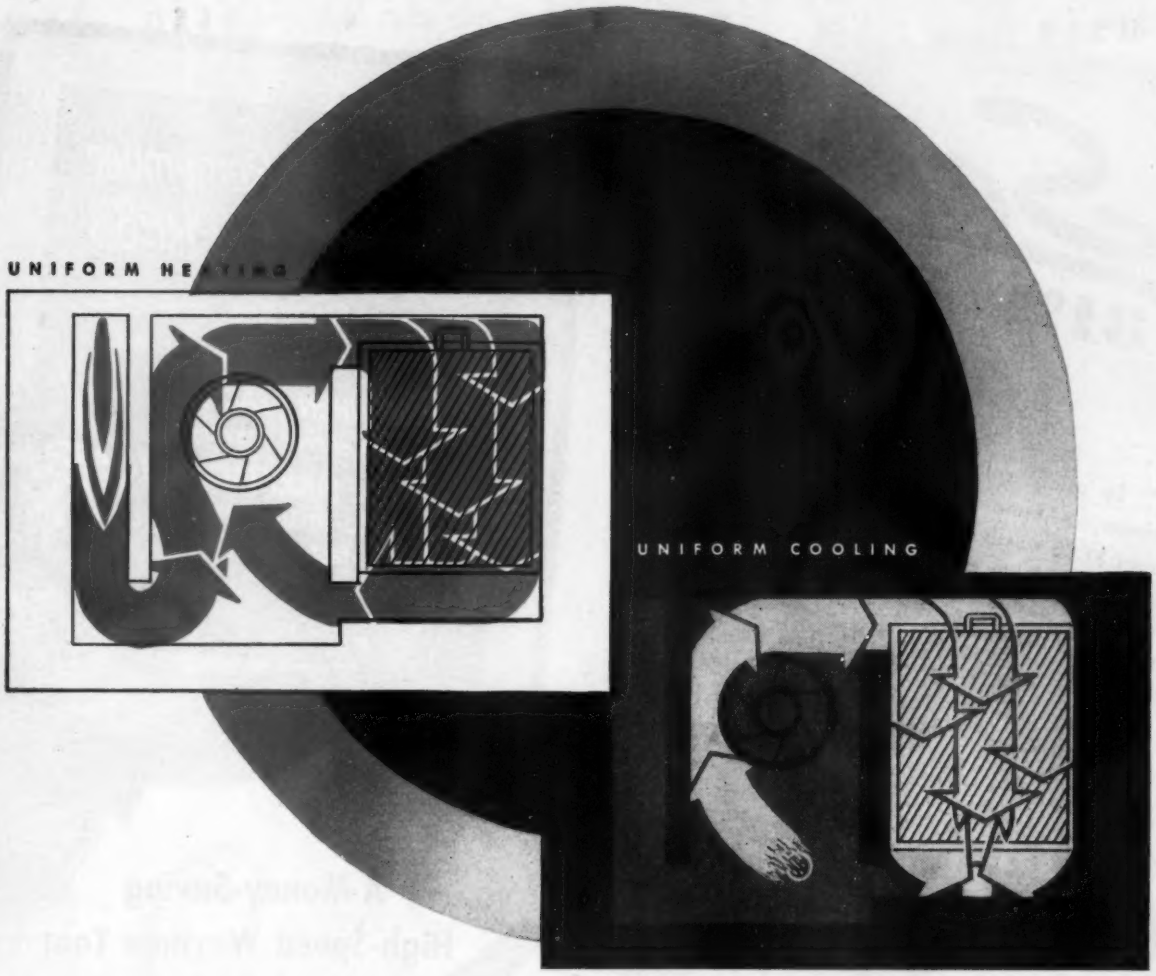

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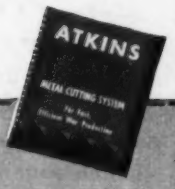

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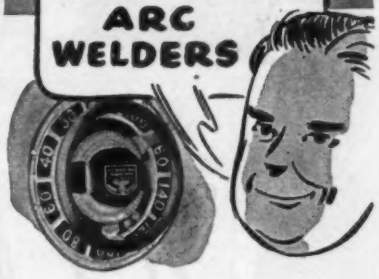

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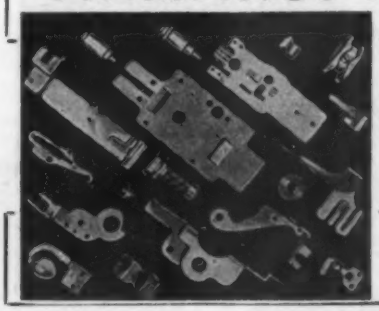

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GENERAL FOREMAN. Machine shop. Small products. Location Conn. Give fully experience, references, salary expected. P-877, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

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DESIGNING ENGINEERS—Mechanical or hydraulic with about 10 years experience. Should have at least 5 years experience in special machine design or 5 years experience in hydraulic design as applied to presses or machine tools. Send photograph and qualifications, also state salary desired. P-879, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

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ENGINEER

Mechanical, with practical shop experience as well as technical training and schooling to work into position of Chief Engineer to succeed man who expects to retire from active work within the next five years.

Man should have experience in manufacturing small precision parts involving gear cutting of all types — grinding — turret lathe and screw machine work — milling — broaching — boring, etc.

Work will be directly under supervision of owners of the company which is a progressive manufacturer established for over 25 years.

P-868, AMERICAN MACHINIST
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Mechanical Designing Engineer

Small machine shop in Newark, N. J., desires to make contact with high type of man that would be interested in purchasing all or part and capable of making designs for miscellaneous machinery that will be encountered in post war work, also to build up business for future. Statement of availability required.

P-865, AMERICAN MACHINIST
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who has had enough experience to take charge of tool room on special machine tools, jigs, fixtures, and gages, for our own plant. Excellent post-war opportunity for man who desires to get connected with a progressive concern established in 1933. Factory located on beautiful Lake Shore Drive, in southwestern Michigan. Give all details and salary expected in first letter.

P-701, AMERICAN MACHINIST
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Men wanted for war work today who will stay with company in postwar period. Hourly rate.

Pleasant, midwestern town of 11,000 population. Low living costs, very modern plant.

Must comply with WMC regulations.

Apply by letter.

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WORKS MANAGER or factory superintendent for long established New England concern, manufacturing special machinery. Must be thoroughly experienced in modern shop organization, production methods and cost control. Ability to get effective results from 150 employees under congenial conditions. Submit past record and recent snapshot. Excellent future for right man. P-880, American Machinist, 330 W. 42nd St., New York 18, N. Y.

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PLANT MANAGER: Engineering graduate, age 36, now superintendent and with 15 years industrial engineering background seeking to assist in management of plant whose war time and postwar plans require smooth introduction of practical production and cost controls. Experienced from both line and staff end in incentive wage payment, cost reduction, budgetary control of expense, product planning, coordination and control of development of new products. Detailed record of experience on request. PW-870, American Machinist, 330 W. 42nd St., N. Y. 18, N. Y.

WANTED—connection as assistant to shop executive in research and development or production. Age 47, with experience in shop management, development and light manufacturing. Prefer central or southern location. Must have post-war program and chance to advance. PW-847, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

SEASONED WORKS manager and chief production engineer is immediately available for a permanent position with a reliable firm. Position must afford plenty of responsibility both for the present and a good postwar future to a man with broad shop and organization experience in modern production methods. Married, one son. Perfect knowledge of useful foreign languages. Salary not less than $12,000 per annum required. Record and references on request. PW-875, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

INDUSTRIAL & SALES engineer: Production problems, marketing, financing, reconversion, wide acquaintance in all parts of U. S. Excellent Washington connections. 25 years experience. Send for resume. PW-882, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(*Continued on page* 310)

A Place with a Future as

MACHINE SHOP FOREMAN

for Central Ohio Manufacturer of Heavy Machinery

Must have 10 or more years machine shop supervisory experience and a record as a real producer.

We are a long established company and have no reconversion problems.

If you are qualified and interested in an assured future, this is your opportunity to help finish the war on highest priority contracts and then immediately start production for millions of dollars of postwar orders already on our books.

Address Box
P-873, American Machinist
520 NORTH MICHIGAN AVE.
CHICAGO 11, ILL.

A Place with a Future as

PROCESS and METHODS ENGINEER

with Central Ohio Manufacturer of Heavy Machinery

Must have had 5 or more years experience and a record of accomplishment.

We are a long established company and already have our postwar products and markets waiting as soon as war contracts are completed.

If you are qualified and interested in an assured future with a progressive company that intends to keep on improving its processes and methods.

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P-874, American Machinist
520 NORTH MICHIGAN AVE.
CHICAGO 11, ILL.

OPPORTUNITY

EXPERIENCED MECHANICAL ENGINEER

Engineer wanted with wide experience in designing and developing medium-sized automatic machinery, precision type, interchangeable parts, and electrical and hydraulic controls.

Applicants will only be considered who have had wide experience in Engineering and Development Work, and must be competent to supervise all details.

An exceptional opportunity to become connected with an outstanding firm, modern factory, up-to-date methods, and located in a beautiful city in Connecticut. Good Schools, homes and surroundings.

For consideration state in detail present position, past experience, age, nationality, and salary wanted. Interview will be arranged and all correspondence considered strictly confidential.

P-872, AMERICAN MACHINIST, 330 West 42nd Street, New York 18, N. Y.

SELL YOUR SURPLUS EQUIPMENT

IT IS NEEDED TO SPEED THE WAR'S END

DSP INC. ORGANIZATIONS

We have a demand for your surplus and idle equipment—a single item or a complete plant. Send us your list of such equipment—and put it to work where it is needed most.

WE PURCHASE ON A CASH BASIS

DULIEN STEEL PRODUCTS, INC.

of Washington	of California	of New York
200 NATIONAL BLDG.	11611 SO. ALAMEDA	2280 WOOLWORTH BLDG.
SEATTLE 4, WASH.	LOS ANGELES 2, CALIF.	NEW YORK 7, N. Y.

NEW INVENTIONS WANTED

Mechanical and electrical devices for post-war manufacture and sale. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

WANTED

National, 3/16" long stroke, Rivet Header or equivalent. Immediate delivery.

CHERRY RIVET CO.
231 Winston St. Los Angeles 13, Calif.

WANTED

3B PRATT & WHITNEY JIG BORER
Not over 5 years old
With or without additional accessories
Address: W-854, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

WANTED:

6 or 8 Spindle Bullard Mult-au-Matics
(Machine must be in running condition)
NYLEN PRODUCTS COMPANY
St. Joseph Michigan

DO YOU NEED ENGINEERS TO DESIGN OR RE-DESIGN YOUR PRODUCTS?

Our Product Design Department has engineers experienced in creative design of new products and for the modernizing of old.

Our two Plants are furnishing the following Engineering Services to many Companies throughout the U. S. A.

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Tool Processing
Aircraft Designing
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Tool Procurement
General Drafting
Electrical Layout
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Product Designing and Development

Whether your Engineering or Designing problems are large or small, allow us to submit a proposal on your work.

H. L. YOH COMPANY
PRODUCT DIVISION
740 Sansom Street Philadelphia, Pa.

(Continued from page 309)

SELLING OPPORTUNITIES
OFFERED—WANTED
Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITY OFFERED

MANUFACTURER'S REPRESENTATIVE wanted by a midwestern manufacturer of metal stampings in small lots. Some very desirable territory still open on a protected commission basis. Die stamping knowledge an advantage. Reply Room 209, 549 Washington Boulevard, Chicago, Illinois.

BUSINESS OPPORTUNITY

FOR SALE—Business of scientific and surgical instruments, established 25 years, and machine shop consisting of lathes, drill presses, punch press, milling machine, screw machine—fully equipped with tools, cutters, etc. Sell because of ill health. BO-864, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W. Washington 5, D.C.

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MANUFACTURING FACILITIES WANTED: Forging, cold heading or punch press shop wanted to make several million pocket knife bolsters for us. Write for samples. Union Cutlery Co., Inc., Olean, New York.

GEAR CUTTING: Would like to contact shop with facilities for cutting large quantities of small steel pinions—24 D.P.—¾" maximum diameter—1" maximum face. CW-883, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED

MACHINE AND TOOL SALESMEN

EXCEPTIONAL OPPORTUNITY FOR HIGH GRADE EXPERIENCED MEN TO EXPAND INCOMES HANDLING HIGH QUALITY WELL KNOWN CUTTING OILS AND LUBRICANTS IN ADDITION TO THEIR OWN LINES. ATTRACTIVE COMMISSION. *WRITE COMPLETE DETAILS.*

SW-867, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

HIGH GRADE AGENTS WANTED

We are looking for strictly first class representation by men with a proved record of performance and acceptance in their territories. Our present products include plug, ring and instrument gages, ground thread taps, various other perishable tools and machine tool accessories. We have a definite postwar product and merchandising program.

All field efforts are supported by national advertising, direct mail campaigns and product catalogs.

We prefer men with one or two related non-competitive lines and who are capable of both sales and service.

If interested, write

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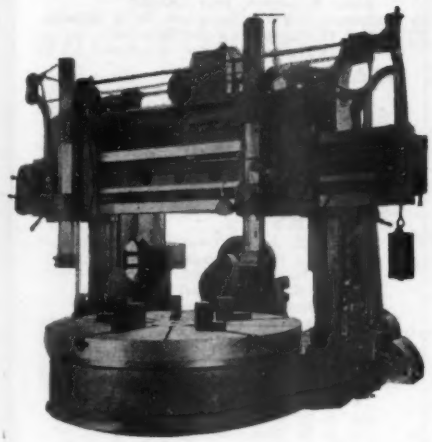
1300 E. Nine Mile Rd., Detroit 20, Mich.

IMMEDIATE DELIVERY

"FALK" for DEPENDABILITY in Rebuilt Machinery

BORING MILLS



100" Niles-Bement-Pond Boring and Turning Mill.

Vertical, 48" Gisholt.
Vertical, 52" Colburn.
Vertical, 60" Colburn.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".

COMPRESSORS

8 x 8 Bury Horizontal.
8 x 8 Sullivan.
6 x 8 Bury.

RADIAL DRILLS

4' Arm Cincinnati Bickford.
5' Arm 11" Rd. Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cincinnati Bickford, air clamp.
7' Arm 15" Bickford.

GRINDERS

16" Heald Rotary Surface Grinder.
12" Persons-Arter Rotary Surface Grinder.
12" Heald Rotary Surface Grinder also equipped with 9" Dia. Permanent Magnetic chuck.
#2 Cincinnati Centerless Grinder, Filmatic.
#12 Greenfield Hydraulic Internal Grinder.
#1½ Cincinnati Universal Tool & Cutter Grinder, Motorized.

MILLING MACHINES

No. 3 Cincinnati, High Power, Plain with Vert. Head & Rotary Table, M.D.
No. 5 Cincinnati, High Power, Plain, S.P.D.
No. 4 Cincinnati, High Power, Plain, S.P.D.
No. 3 Cincinnati, High Power, Vertical.
No. 2 Cincinnati, High Power, Plain.
No. 2 Cincinnati, Motorized, Pyramid Col.
No. 2 Brown & Sharpe, Plain (10).
No. 1½ Brown & Sharpe, Plain (2).
1—#2 Brown & Sharpe vertical.
No. 1½ Valley City Universal, Cone Dr.
No. 1 Brown & Sharpe, Plain (6).
No. 12 P & W Lincoln Type Production (2).
No. 00 Bickett and Miller.
No. 0 Bickett Vertical Bench Miller.
Ames Precision Universal Bench Mill.
P & W 2" Duplex Spline Miller.
Hall Planetary Thread Miller 24"
No. 8 Lees Bradner Thread Miller.
#40-H Index Universal Vertical Mill, like new.

No. 3 Cincinnati High Power, Vertical
1—Brown & Sharpe #2 Vertical Miller, single pulley drive.

ANGLE BENDING ROLL

Bertsch 3" x 3" x ⅜".

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.*
72"x72"x18' Pond Heavy Pattern, 4 Heads.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cincinnati Heavy Pattern, 2 Hds.

PLANER - SHAPER

20" x 20" x 36" Niles-Bement-Pond, M.D.

SHAPERS AND GEAR CUTTERS

16" Queen City M.D.
7" Rhodes Horiz. High Speed, Belt Dr.
26" Cincinnati Triple Geared Belt Dr.
#612 Fellows 36" Gear Shapers, (2)
14" Steptoe, M.D.
12" Schuchart & Schutte Gear Hobber.

AUTOMATICS

Davenport Model "B" High Speed, 5 spindle 9/16" cap. Threading spindle, complete, perfect condition.
#0 Brown & Sharpe full Automatic Motorized, Serial 5721.
Brown & Sharpe #0 full automatic with plotting attachments (2).
Cleveland Model "A" ⅞" Cap. Motorized Countershaft, full equipment. Oval Pan, serial 11000, good cond. $700.00.

LATHES

Monarch 16" x 8' Q. C. G. with Taper Attachment and Chuck.
South Bend 16" x 6' Motorized Gap Lathe.
Rockford "Sundstrand" Tool Room Lathe, 16" x 6' complete Motorized, Collets, Taper att. Chuck, etc.
LeBlond 21" x 16' High Duty, Taper, Chuck, M.D.
Schumaker & Boye 20" x 10' QCG**, Taper, Chuck, Belt Dr.
Putnam 26 x 12 Heavy QCG, arr. for M.D.
South Bend 13" x 6' Motorized, Pl. Chge Gear; Complete.
Seneca Falls 12" x 5' Belt Dr. Pl. Change, "Star Lathe."
1—#6 Warner & Swasey turret lathe, geared friction head, cross sliding turret, arranged Lima motor drive.

MISCELLANEOUS

High Lift Truck, Platform type, Lakewood 4000# Capacity; Less Batteries. Lacquer Heater, J. C. Miller Co. with Acquastat. Heat Treating Furnaces for the Tool Room, all sizes. Multiple Spindle Drills; 54 Spindle Fox Hydraulic #15H; Multiple Spindle Drill; 24 Spindle Fox #D31, Motor Dr. Weigel 22", Upright Drill, sliding Head, Tapping Att. Power Feed Superior 26" Upright Drill, Sliding Head, Tapping Att. BG&PF. Wire Coiling Machines for making BX cable, Sleeper & Hartley #1-50KW Moesta Gun Welder Transformer, portable, 25 cycle, 440 volts. Grinding wheels for #2 Centerless 4" face, 20" Diam.

Headquarters for Punch Presses

THIS IS A PARTIAL LISTING OF OUR STOCK. SEVERAL HUNDRED ADDITIONAL ITEMS IN STOCK. SEND US YOUR INQUIRIES.

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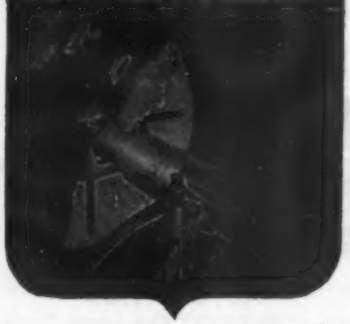

Every machine listed in this column is in our warehouse at press time.

36" BULLARD Vertical Turret Lathe
42" N.B.P. Car Wheel Borer
66" NILES-BEMENT-POND Boring and Turning Mills, M.D.
#0 FOSDICK Horizontal Boring, Drilling & Milling Machine, M.D.
4' HAMMOND Hi-Speed Sensitive Radial Drill, M.D.
33" x 9" GOULD & EBERHARDT Spur Gear Cutter
No. 6 BROWN & SHARPE Spur Gear Cutter
3' WESTERN Plain Radial Drill
7' AMERICAN Universal Radial Drill, M.D.
42" PUTNAM Double End Car Wheel Lathe, M.D.
#3-B MILWAUKEE Plain Miller
#2 CLEVELAND Plain Miller
#10 NILES Vertical Milling Machines
#6 BECKER Vertical Milling Machine
30"x30"x10' NEWTON Slab Miller
12" Wm. SELLERS Slotters
20" SELLERS Crank Slotter, M.D.
12"x12" ACME Power Hack Saw, M.D.
48"x48"x24' N.B.P. Heavy Planer, Two Rail, One Side Head, M.D.
48"x48"x20' PATCH Planer, 4 heads, 230 volt D.C. Rev. M.D.
24"x24"6' WHITCOMB Planer, 230 volt D.C. Reversing M.D.
42"x48"x12' SIMMONS Openside Planer, 230 volt D.C.
4"x4" capacity ALLIGATOR Shear, Low Knife, M.D. 24" Blade.
#1 L&A Multiple Punch, 100 Tone, 72" between housings
6"x6⅝"SOUTHWARK Double Angle Shear
SCHULTZ - NAUMANN Beam Shear, 20", 60 lb. and smaller
60" Throat, 8" x 1 1/16 LONG & ALSTATTER Shear
54" Throat 1¾"x1⅛" HILLES & JONES Punch
42" Throat, 1¾"x1" HILLES & JONES Punch, M.D.
4" LANDIS Pipe Threading Machine
6" BIGNALL-KEELER Improved Pipe Machine
10" STANDARD Pipe Threading Machine
4" BAKER Heavy Duty Automatic Tapping Machine

SIMMONS ENGINEERED EQUIPMENT

SIMMONS MACHINE TOOL CORP.
1759 North Broadway, Albany 1, N.Y.
N. Y. Office: 50 East 42nd St.

EASTERN OFFERS FROM STOCK

Prompt Shipment — No Priority

ENGINE LATHES
18"x6' American, 12 speed geared head, m.d. in base
18"x6' Hendey Yoke Head, m.d.
14"x6' American Geared Head, m.d.
14"x8' Sidney, cone
16"x6' Reed Geared Head, m.d.
14"x6' Springfield, m.d.
19"x10' Sidney, cone
20"x9' Lehmann Geared Head, m.d., taper
20"x11' Reed-Prentice Geared Head, m.d.
22"x16' centers (22' bed) American 100 H.P. Input Super Lathe, with power rapid traverse, chip conveyor, chip breaker, 100 H.P. direct current variable speed motor with control
22"x18' Niles, cone
24"x10' New Haven, cone
24"x10' Greaves-Klusman, taper, cone
24"x12' LeBlond, m.d.
24"x12' Schumacher-Boye, cone
24" raised to 30"x12' Fifield, cone
25"x18' LeBlond Geared Head
26"x12' Schumacher-Boye, cone
27"x16' LeBlond, cone
30"x14' American Geared Head
30"x14' Lodge & Shipley, m.d.
30"x28' Greaves-Klusman, cone
36"x10' Putnam, cone, motorized
36"x12' Wright
23"x10'LeBlond Geared Head, m.d.

HORIZONTAL MILLING MACHINES
No. 3B Milwaukee Plain Double Overarm, m.d.
No. 4 Cincinnati Plain, m.d., rect. overarm
No. 4 Cincinnati Plain, m.d., round overarm
No. 4B Milwaukee Plain, m.d., double overarm, vert. attach.
No. 5 Cincinnati Plain, m.d., rect. overarm, extra large table
No. 5B Heavy Brown & Sharpe Plain, m.d.

VERTICAL MILLING MACHINES
No. 4 Cincinnati Vertical High Power, m.d., latest type
No. 2 Kempsmith Vertical Maxi-Miller, m.d. in base, Timken
No. 2 Brown & Sharpe, m.d.
No. 2 Knight, m.d.
No. 4 Knight, m.d.
No. 3 Cincinnati, m.d.
No. 5 Jackson, m.d.
No. 6 Becker, cone
2 spindle Newton, m.d.
No. 2M Cincinnati Vertical, rotary table, latest type, m.d. in base

INTERNAL GRINDERS
No. 72A3 Heald Sizematic, 2 motor drive
No. 6 Bryant, belt
No. 10 Bryant, belt
No. 20 Bryant, belt

SURFACE GRINDERS
No. 3 Abrasive, m.d.
38"x38"x12' Gray Planer Type, m.d.
No. 1 Fraser Lapper, 26" plate
14" Pratt & Whitney Vertical Surface, m.d.
54" Bridgeport Knife, belt

TOOL & CUTTER GRINDERS
No. 1 Cincinnati Cutter & Tool, belt
Gisholt Universal Tool, belt
Gleason Cutter, belt
Gould & Eberhardt Gear Cutter Grinder, belt

HAMMERS
No. 400 Bliss 400 lb. Board Drop
600 lb. Niles-Bement-Pond Steam
800 lb. Bement Single Frame Steam
1100 lb. Bement Single Frame Steam

KEYSEATERS
1" Morton, belt
No. 2 Morton, belt
30" stroke Morton, 2½" cap.

MANUFACTURING LATHES
3½"x36" LoSwing, s.p.d.
3x80" LoSwing, s.p.d.
8x84" LoSwing, s.p.d.
No. 9 Heavy LeBlond Multi-Cut, m.d.
9x12" Sundstrand Mfg.
11"x4' F. E. Wells Speed Lathe
15"x6' Automatic Threading Lathe
20x48" centers LeBlond Rapid Production, m.d., latest type
20"x16' American Geared Head arranged for spindle boring
Niles-Bement-Pond Axle Lathe, cone
42x96" Niles-Bement-Pond Car Wheel Lathe, m.d., brand new
42x96" Niles-Bement-Pond Car Wheel Lathe, m.d., with motors, used
Niles-Bement-Pond Quartering Machine, m.d., brand new

More than 1,000 machines in stock.

The EASTERN MACHINERY CO
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AUTOMATICS
⅞" Cleveland Model M, four spindle
1¾" Gridley Model G, four spindle
3¼" Cleveland Model A, single spindle

BROACHES
No. 4 LaPointe, m.d.
15 Ton Hercules, m.d.

DRILLS
30" Hamilton Upright, p.f.
24" Superior Upright, p.f.
3' Prentice Radial, s.p.d.
4' Dresses Radial, s.p.d.
No. 310 Baker, single spindle
24" Barnes Camelback, single spindle
Avey Sensitive, four spindle
Leland-Gifford, Sensitive, three spindle
No. 11 Natco Multiple Spindle
No. 14 Natco Multiple Spindle

GEAR CUTTERS
No. 12 Barber-Colman
No. 6 Fellows Gear Shaper, m.d.
30" x 10" Maag Gear Shaper, m.d.
No. 3 Brown & Sharpe Automatic Gear Cutter
30" Consolidated Gear Tooth Rounder
96" Gleason Spur & Bevel Gear Planer

GRINDERS
No. 2 Cincinnati Centerless
No. 72A3 Heald Gagematic
No. 75 Heald Internal
No. 70 Heald Internal
No. 3 Landis Universal
30" Diamond Face, 84" table travel
No. 2 Wilmarth & Morman Surface
No. 12 Brown & Sharpe Cutter

LATHES
14" x 6' Lodge & Shipley, g.h.
14" x 10' Pratt & Whitney, c.d.
16" x 10' Monarch, g.h.
18" x 6' Lodge & Shipley, g.h.
20" x 8' Lodge & Shipley, c.d.
22" x 10' Lodge & Davis, c.d.
29" x 14' Schumaker, Boye & Emmes, c.d.
8" x 60" Fitchburg Lo-Swing, g.h.

TURRET LATHES
24" Bullard New Era V.T.L., m.d.
12" Bullard Mult-au-Matic, m.d.
No. 4A Warner & Swasey, 7¾" Hole, Timken
No. 1B Foster, m.d.
2¼" x 24" Jones & Lamson, M.D. (serial over 40,000)
No. 4 Warner & Swasey, c.d.
No. 1-SP Garvin, c.d.

MILLS
No. 20 Van Norman Duplex, m.d.
No. 1M Cincinnati Universal, m.d.
No. 2 Milwaukee Plain, c.d.
No. 3 LeBlonde Plain, c.d.
No. 3 Brown & Sharpe Vertical, m.d.
Model C Becker Vertical, m.d.
Model B Gooley & Edlund, c.d.
No. 12 Brown & Sharpe, c.d.
144" Betts Vertical Boring Mill, 2 head, m.d.
4" Fosdick Horizontal Boring mill, m.d.
Pratt & Whitney Spline Mill

MISCELLANEOUS
16" Betts Slotter
Wicaco Oil Groover
No. 3 Eclipse H.S. Furnace

PLANERS & SHAPERS
24" x 24" x 8' American Planer, one head
30" x 30" x 12' Ohio Planer, two heads
48" x 48" x 12' Cincinnati Planer, 4 heads
96" x 96" x 25' Detrick & Harvey Openside Planer, 4 heads
24" Gould & Eberhardt Shaper, s.p.d.

Complete Facilities for REBUILDING and MOTORIZING Your Old Machine Tools.

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Modernized
CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH

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10x36	14x36	16x50
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Send for a copy of our catalog "Super Grinding."

Have you any NORTON grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO.
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GEAR MACHINERY
9" Pratt & Whitney Gear Grinder, M.D.
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper, M.D.
Cimatool Gear Chamfering Mach., M.D.
Lees-Bradner Gear Grinder

SHAPERS—PLANERS
18"x18"x 4' Whitcomb Planer
36"x36"x 8' Woodward & Powell Planer, Rev. M.D.
36"x48"x12' Cins. Hypro. Planer, 4 hds.

MILLERS
4¼"x12" Pratt & Whitney Thread Millers
Model L. T. 6"x36" Lees-Bradner thread miller, latest type
No. 25-B Defiance Hor. Bor. Mill 3¾" bar, New 1941
No. 1—12" and 1—18" Cincinnati Plain Automatic millers, latest type (19)
No. 2 Cincinnati Vertical Miller, Dial Type (11)
No. 2-3-4 Plain & Vertical Cincinnati High Power Millers, M.D.
New No. 3 Wigglesworth

GRINDERS
16"x216" Landis Pl. Grinder—latest type
No. 35 Gallmeyer & Livingston Hydraulic Surface grinders, latest type (6)
18"x120" Norton Type C Grinder—latest type
10"x120" Norton Pl. Grinder, M.D.
12"x120" Landis Pl. M.D.
No. 10 B & S Plain Grinder, M.D.
No. 3 Oesterlein C & T Grinder

LATHES—TURRET LATHES
9"x8¾" Gaas & DeLeeuw Chucking Machine
1⅝" 4-spdle. Model G Gridley, M.D.
2½" Cleveland Model A
No. 3A Warner & Swasey 4½" Bar stock late type

MISCELLANEOUS
No. 21-SA Cochrane-Bly H.S. Saw
No. 171 Bliss Stiles Sprue Cutter
New Delta Drilling Equipment

WIGGLESWORTH MACHINERY CO.
203 Bent St., Cambridge 41, Mass.

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"Searchlight" is the classified advertising of Employment, Equipment and Business Opportunities in American Machinist. It reflects current opportunities, both offered and wanted. Use it for your business wants.

ROTO BLAST FURNACE

With Automatic Controls
Range 350° — 1200° F.

Catalog No. 7-AD. Basket 28" x 28". Contents 10 cu. ft. Width of furnace 64", length 90". Working height 60". Gas demand 400,000 BTU/hr. 5 HP. motor.

MOTT SAND BLAST MACHINE

MDNA MEMBER

Fully automatic, 4 movable jets. Size of door 18" x 24". Endless rubber belt conveyor. Completely equipped with variable speed motors and reducers. Built in 1938. Additional details on request.

LAKE MACHINERY CO.
652 W. LAKE STREET — CHICAGO 6, ILL.

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BORING MILLS
VERTICAL

120" Niles
42" Bullard, turret head, swivel head
54", 62" Colburn, M.D.
36" Bullard V.T. L., side head
66" Nfles-Bement-Pond

HORIZONTAL

2½" Universal, Binsee
4" Dietrich & Harvey Floor, M.D.
4" Binsee
4½" Bement-Niles

TURRET LATHES

26" Libby, 7½" hole
18" Libby, 3½" hole
24" Gisholt, 6½" hole
Foster No. 1B, M.D.
Foster Nos. 4, 5, 6
W. & S. Nos. 2, 4, Universal, M. D.
Gisholt Automatic, M.D.
J. & L. 2¼x24", 3¼x36"
Acme 3¼x36" grd. head
W. & S. No. 3A
No. 3A W. & S., 4½" hole

GRINDERS

P. & W. 14", 18", B.B. vert., M.D.
Blanchard 26", 30" M.D.
Modern 12x48", M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 55, 72A Internal, M.D.
Norton 50"x28', M.D.
Gardner 72", Disc, M.D.

LATHES

48"x12' Harrington Gap Sld. Bed
McCabe 26-42"x14'
26"x24' Putnam 3 step cone, D.B.G.
24"x12' Boye & E. 3 step cone, D.B.G.
20"x14' Rahn-Larmon, raised to 24"
16"x8' Lodge & S. Grd. hd., taper, M.D.
14"x6' Hendey tie bar, taper
14"x6' Mulliner, taper, collets

AUTOMATICS

Cleveland Model A, ½", ⅝", 1¼", 2"
Cleveland Model B, 1", 2"
Gridley 1¼", 2¼" 4 spindle
Cleveland ⅞" Model M, 4 spindle
Gridley 4½", single spindle, M.D.
P. & J. No. 6A, M.D.
New Britain, 1⅝" x 7", six spindle

SHAPERS

14" P. & W., M.D.
20" Stockbridge
20" G. & E., S.P.D.
26" Stockbridge, M.D.

GEAR CUTTERS

B. & S. Nos. 3-26", 4-36"
Gleason 11" Bevel
Pfauter No. 3 Gear Hobber, 59" cap.
No. 3 Barber-Colman Gear Hobbers

MILLING MACHINES

Providence Planer Type 32"x8'
Nos. 2, 3, 4, B. & S., and Cin. Plain—Univ.
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12 Profiler, M. D.
No. 2 Kent-Owens
Hall Planetary Thread Miller, Model D
No. OY B. & S., M.D.
No. 1Y B. & S., M.D.
B. & S. No. 12
No. 2A Milwaukee, S.P.D.
No. 3S Cincinnati, S.P.D. rapid traverse
No. 1½ Cincinnati Universal
No. 2 B. & S. Vertical
No. 3 Brown & Sharpe Plain

RADIALS

4' American Triple Purpose
8' American Triple Purpose, M.D.
5' Dreses, Full Universal
3' Cincinnati-Bickford
2¼' American
4' Mueller, M.D.
4', 5' Western, S.P.D.

MISCELLANEOUS

Pels 6' throat punch
P. & W. 6" Vert. shaper
Marvel Metal Band Saw, M.D.
McCabe ½" Flanger
Pipe Machines, 2", 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
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Pottstown, Anderson Tappers
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Thompson-Gibbs Spot Welders 17 KVA
6 spindle Avey Drill, 15" overhang
800 ton coining press

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Le BLOND 17"x6' Rapid Production Lathe with turret att.—M.D.
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HAMILTON 42"x42"x20' Planer; 3 heads; DC motor drive
LUCAS 3" bar Horiz. Boring Mill, M.D.
LEES BRADNER #6 Thread Miller
AMERICAN 5' Radial Drill—motor on arm; triple purpose
NATCO C-13 Hyd. Mult. Spindle Drill
LANDIS 20"x220" Plain Grinder; M.D.
LANDIS #3½ Int. Hydraulic Race Grinder
DIAMOND #4 Surface Grinder; Hyd. Feeds
ARTER 8" Rotary Surface Grinder; M.D.
GLEASON 6"-18" Bevel Gear Generators
G & E 18" Gear Hobber; M.D.
G & E 36" Gear Hobber; M.D.
ESPEN LUCAS No. 150 Cold Saw—Cap. 12"
SAUNDERS 8"-16" Pipe Threader
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GISHOLT Precision Balancing Machine
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LYND FARQUHAR 28" Planer Type Shaper

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Cincinnati-Bickford 5', 6' Radials
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Brown & Sharpe #3 Univ.
Bath 10"x25" Univ.
Cincinnati 12"x36" Univ.
Bryant #18 Hole; Bryant #3B, 6, 12 Internal
P & W 14" B.B. Vert. Surface
Farrel Roll Grinder
Monarch & LeBlond 14"x6'
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Johnson 30"x24'
Wickes 32"x14' Cone, M.D.
Lo Swing 4"x60', 3½"x108"
J & L 2¼x24, 3x36 Flat Turret
Brown & Sharpe #2A Universal
Van Norman #2 Duplex
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Becker #4B Vertical; Milw. #1½ B Vert.
Cin. #4 Vertical SPD
B&S #3 Vertical SPD
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Pratt & Whitney 2" Spline Duplex
Pratt & Whitney 4½"x12", 6"x48", 6"x72" Thread Millers
Hanson-Whitney Thread Miller
Pratt & Whitney Gun Barrel Drillers, Reamers, Riflers and Chamferers.
Cincinnati 12" B.G. Mfg.
Becker #7H Lincoln
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6' Niles Pl. Radial Drill, A.C., m.d., Rebuilt.

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AUTOMATICS, Gridley, 9/16, ⅞ & 1¼" Mod. G.
AUTOMATICS, Gridley, 2¼, 3¼ & 4¼" S.S.
AUTOMATICS, Cleveland, 1¼, 1½, 2¾ & 3⅝"
AUTOMATICS, Cleveland, ⅞, 1¼ & 2½" Mod. B
AUTOMATICS, Cleveland ⅞, 1¼ & 1½" Mod. M
AUTOMATICS, New Britain #22 & 24 M.D.
AUTOMATICS, Potter & Johnston #5a & 6A
DRILLS, Edlund #3B-6 spindle, M.D.
DRILLS, Baker Heavy Duty, #5 M.T.
GEAR HOBBERS, #3 & 12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #6
GRINDER, Blanchard #16A Rotary Surface, 80" x18" Magnetic Chuck
GRINDER, Brown & Sharpe #2 Universal, M.D.
GRINDERS, Cincinnati 12" x 18" Plunge Cut
LATHES, 16"x8 Reed-Prentice G.H. M.D.
LATHES, Warner & Swasey #2, 4, & 6, M.D.
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MILLING MACHINES, Becker Vertical #5 & 6
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NILES 12" Vert. Slotter
MILWAUKEE #3-B Vert. Miller, M.D.
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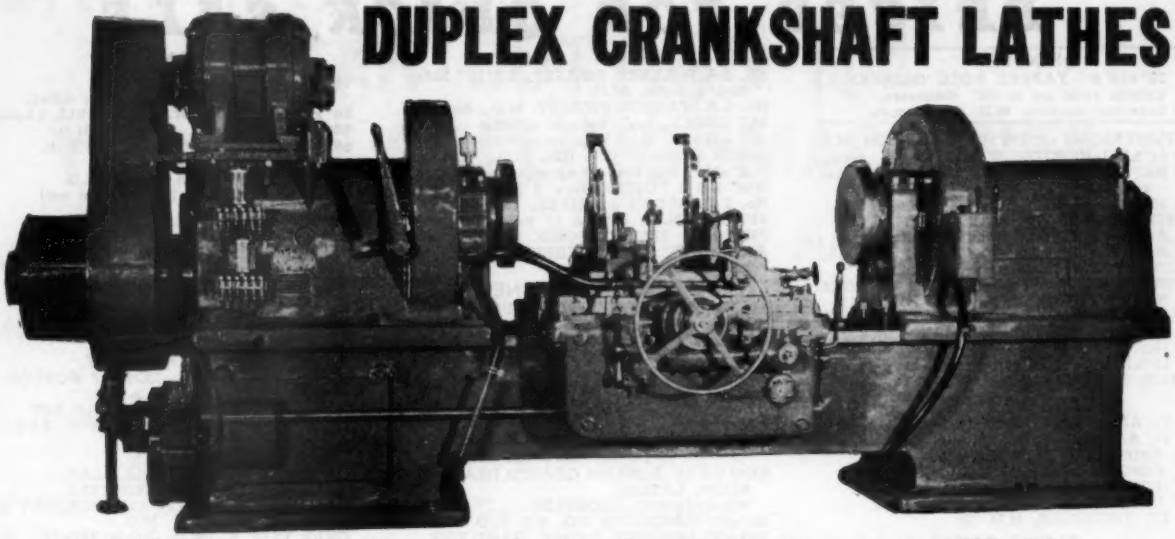

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Swing over bed 34".
Swing over cross slide 20".
Takes between face plates 3' 10".
Capacity of crankshaft 8" stroke x 5 ft. to 6 ft. overall.

Designed for machining one pair of pins at one time and for machining two or more line bearings at a time. These machines may also be used for any heavy turning operations.

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Drill, near 10' Buffalo bench
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Drill, two-spindle sensitive, #1 Morse taper
Drill, Bickford 42" radial
Grinder, #20 Bryant deep hole internal
Grinder, Sellers Tool
Grinder, 60" knife
Hammer, 30# Bradley upright, helve
Lathe, 24" x 18" Steptoe-McFarlan
Pipe Machine, 8" Oster motor drive
Press, #8-7 Zah-Hahnemann straight side grd.
Press, #1 open back inclinable, motor drive
Punch & Shear, two ½" capacity
Threading Machine, #0 Webster & Perks
Turret Lathe, Bridgeport, gap
Vacuum Cleaners, heavy duty for shop use

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18" Libby, 5" hole in spindle, M.D.
Hardinge Precision Optical Lathes, M.D.

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Balancer, Micropoise flywheel
Balancer, 44" Norton
Broach, No. 3, J. N. Lapointe double
Die Casting Machine, AC Spark Plug Co.
Drill, 3½' American radial
Drill, No. 430 Barnes two way
Drill, 20" & 21" Cincinnati Bickford
Drill, with tapping attmt. 25" Weigel
Drill, Nos. 2 & 3 Henry Wright sens.
Drill, Nos. 11, 12 & 13 Natco multiple
Drill, Barnes 2 way, 12" x 48" capacity
Furnace, Lindberg pot type
Furnace, Surface Combustion drawing
Gear Hobber, 16HS Gould & Eberhardt
Gear Hobber, No. 1 Lees Bradner
Gear Lapper, 8" Red Ring
Gear Generator, 15" Gleason spiral bevel
Gear Tester & Lapper, 18" Gleason bevel
Gear Chamferers, Peerless & Lipe
Gear Cutters, 36" & 48" Brown & Sharpe
Grinder, 12" x 36", 16" x 36", 16" x 52" Landis
Grinder, 16" x 48" Landis crankpin
Grinder, No. 72 Heald sizing internal
Grinder, 20" Gardner semi-auto. disc.
Grinder, 8" x 24" LaSalle surface
Grinder, 12" x 24" Diamond surface
Grinder, 24" Cincinnati face milling cutter
Honing Machine, No. 211 Barnes
Lapper, No. 10U Norton
Lathe, 18" x 8' Greaves Klusman QCG
Lathe, Turret, No. 3B Foster
Lathe, Turret, 26" Libby, 4½" or 7½" hole
Lathe, Turret, 36" Bullard vertical, Rap. Pro.
Mill, 42" Bullard vert., 1 plain, 1 turret head
Mill 3" Universal horiz. boring
Miller, No. 2 Van Norman duplex
Miller, No. 2 Brown & Sharpe vert.
Miller, No. 3 Reed Prentice vertical, high speed
Miller, 30" Newton Continuous rotary
Miller, No. 1 Davis Thompson duplex
Miller, Type C Hall Planetary thread
Miller, Size 3 Turnmillers
Miller, Types 10 & 45 Productomatic
Miller, 48" Oesterlein tilted offset
Planer, 24" x 24" x 5' Gray
Planer, 36" x 36" x 16' Cleveland openside
Press, 600 ton Bliss coining
Press, No. 85½ A Bliss reducing
Press, 51", No. SG84 Ferracute dbl. cr.
Press, 34", No. 174 Consol. gap dbl. cr.
Press, 28", No. 71 Swaine double crank
Press, No. 53 Toledo straight side
Press, No. 6 Waterbury Farrel opensback
Press, No. 33 Consolidated arch frame
Press, No. 2 Standard screw type
Press, No. 796¼D Toledo toggle draw
Riveter, Nos 2A, 5½B & 7B High Speed
Roll, No. R60 Yoder fender crowning
Roll, Forging, No. 1 Ajax Evans
Scraper, Anderson electric
Screw Driver, No. 61AA Bodine
Screw Driver, Model C Detroit
Sprue Cutter, Model 1 Tessmer
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Shear, 8" x 8" x 1" Long & Alstatter angle
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Tester, 60,000 & 230,000 lb. Olsen tersion
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Tapper, Natco 1 & 2 way lead screw
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20"-24"-32" Shapers.
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Simplicity Piston Grinder.
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6" Bilgram Bevel Gear Generator.
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Lees Bradner Gear Grinder.
‡6 Fellows Gear Shaper, Cone.
‡2 Pfauter Gear Hobber.

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14" Niles Slotter.

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5' American Plain Radial Drill
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7—BARBER COLMAN Type A Gear Hobbers

7—BARBER COLMAN No. 3 Precision Gear Hobbers

6—GLEASON 3" Bevel Gear Generators

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1—PRATT & WHITNEY 4½"x36" Thread Miller—Model C

ALL MOTOR DRIVEN AND INCLUDING 3 phase, 60 cycle, 220 volt A.C. motors

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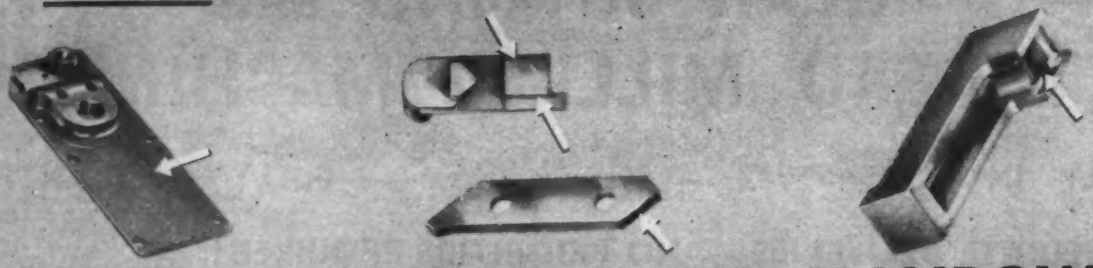

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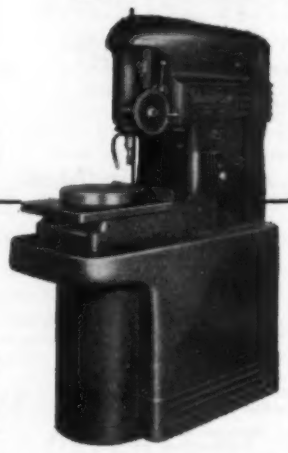

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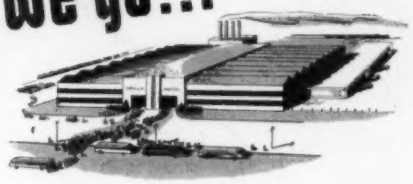

In September, 1918, Marshall Foch asked the staffs of the American, British and French Armies to report their considered views on the time required to defeat Germany. The most optimistic said one year. Yet in less than three months the war had ended.

Even now the switch from warwork to "peacework" may come more quickly than we dare hope for . . . from high-pressure war production at any cost to steady peacetime production at lowest cost. How to reduce product costs with wage scales remaining high, may not be as difficult as it seems. Other facts, besides wages, affect the selling price. Production equipment is one. The lathe that wastes even the decimal part of your production penny cannot be tolerated.

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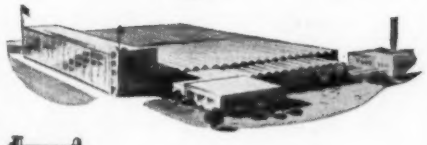

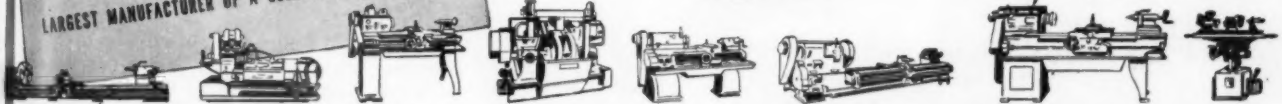

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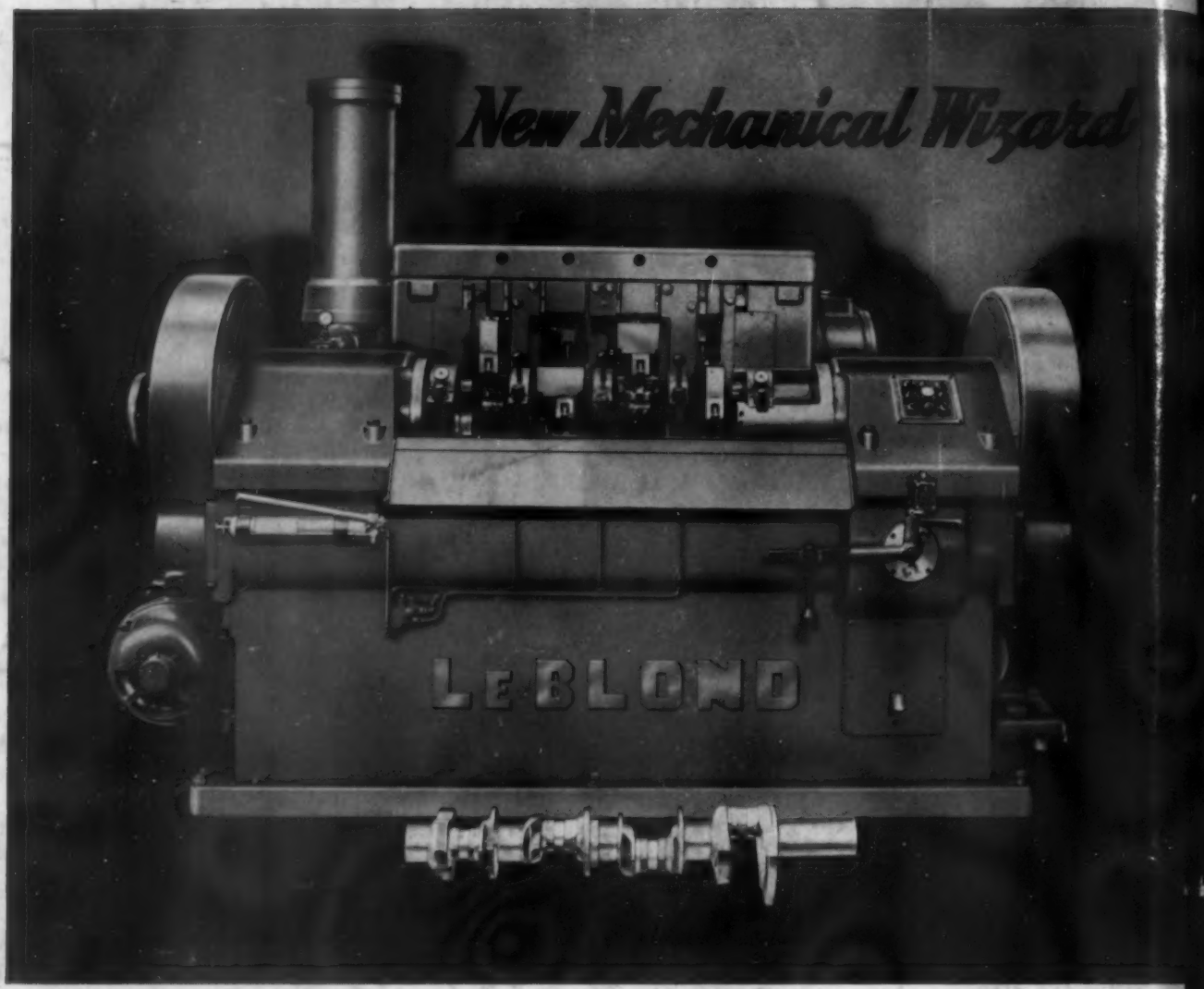

The emergencies and urgencies of war have stepped up the tempo of mechanical development to a point far above its normal peacetime rate.

This new LeBlond Crankshaft Pin Bearing and Cheeking machine is a good example of it. Specifically this machine forms all crank pin bearings, faces all cheeks and fillets, forms the diameter of the cheeks and finishes all the crank pin fillets. These operations are performed simultaneously with a uniformly high degree of precision.

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